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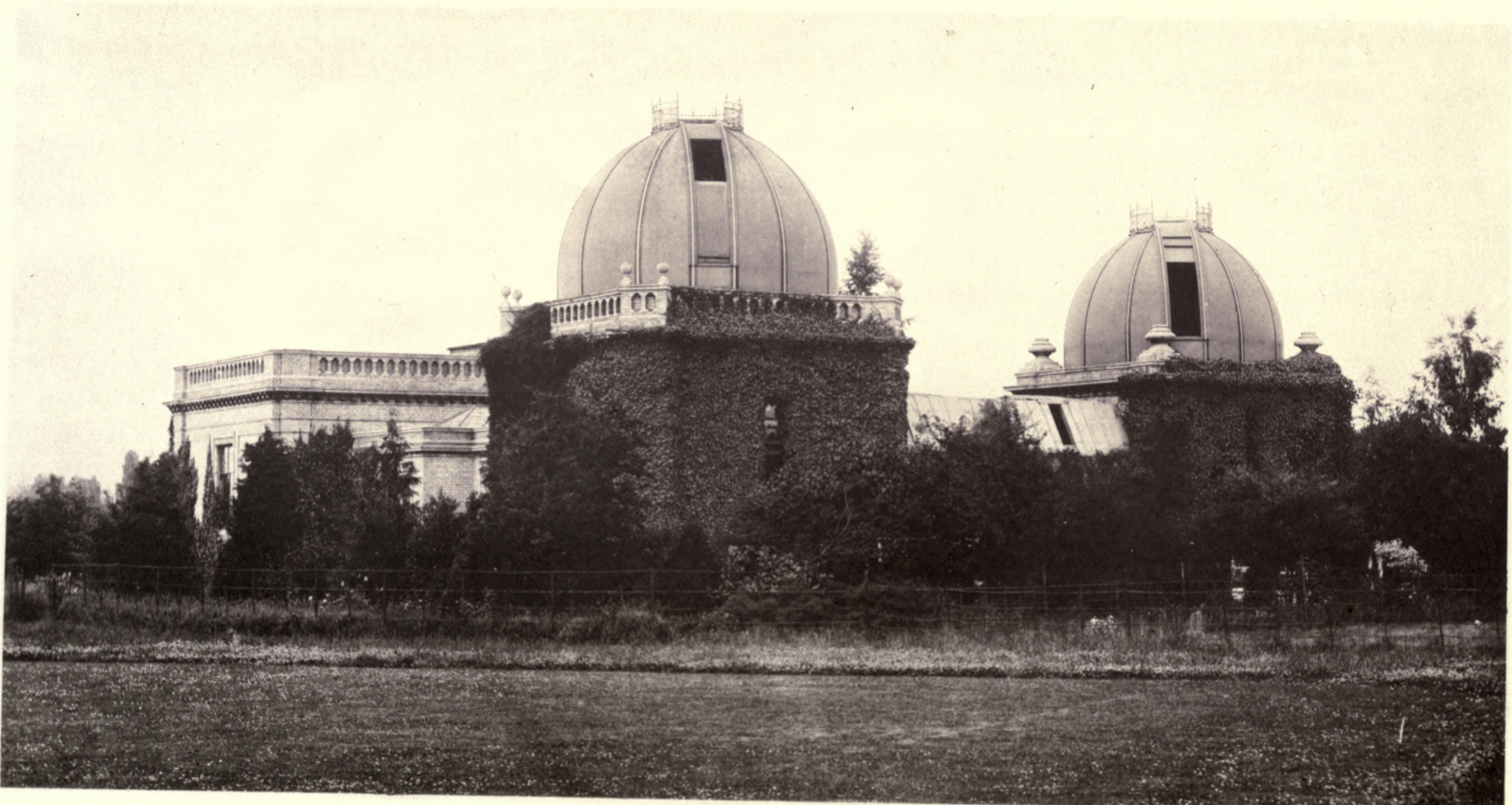

C. Barry, Architect, 1873.

C. Pritchard, D.D., F.R.S., Director.

THE UNIVERSITY OBSERVATORY, OXFORD.

RESEARCHES IN STELLAR PARALLAX

BY THE AID OF

PHOTOGRAPHY

FROM OBSERVATIONS MADE AT

THE OXFORD UNIVERSITY OBSERVATORY

UNDER THE DIRECTION OF

CHARLES PRITCHARD, D.D., F.R.S., F.G.S., F.R.A.S.
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PREFACE.

THE introductory remarks and the ample Table of Contents which precede them, render an elaborate preface unnecessary. The Observatory, in which the observations contained in this volume have been made and reduced, was erected by the University of Oxford at the instance of the present Professor in the year 1874. The general plan is the Professor's, but the external design is that of Mr. Charles Barry. In 1877, a large and very convenient Lecture-room and Library were added, after the design of the afore-mentioned eminent architect. The general aspect of the building is very fairly represented in the collotype reproduction in the Frontispiece.

The principal astronomical instruments are three. I. An equatorially mounted telescope of twelve-and-a-quarter inches aperture and nearly 180 inches focal length, furnished with solar and stellar spectroscopes and other necessary appliances, by Mr. (now Sir Howard) Grubb. In 1888, the tube of a photographic telescope was mounted on that of the afore-mentioned equatorial, and the driving apparatus was very greatly improved, so as to permit the protracted exposures now rendered necessary for the photography of the more faintly illuminated of celestial objects, but the tube unfortunately has long waited for and still awaits its object-glass of 13 inches aperture. This photographic telescope is the gift of the recently deceased Dr. Warren De La Rue, whose long continued generosity to the Observatory entitles him to be regarded as a co-founder of the Observatory, in conjunction with the University of Oxford. II. A Transit Circle by Troughton and Simms. Its aperture is four inches, and its two divided circles are three feet in diameter. The microscopes and field of the telescope are illuminated by electricity, and the instrument is capable of reversion. The whole arrangement is the gift of J. Gurney Barclay, Esq. III. An equatorially mounted Reflecting Telescope of 13 inches aperture and 10 feet focal length. This instrument, with its singularly excellent metallic mirrors, was constructed personally by the late Dr. Warren De La Rue, and after long and effective use by him was presented to the University of Oxford. Its clock and motive machinery were entirely renovated and improved by Messrs. Troughton and Simms at Dr. De La Rue's

expense. It is now capable of permitting many hours of exposure for photographic plates without distress to the observer. With it all the photographs necessary for the researches contained in this volume have been taken. The munificent donor had expressed his desire to replace the 13 inch mirror by a larger one of 24 inches aperture; but, unfortunately, his decease occurred before the realization of his intention.

Besides the important and costly gifts to the Observatory referred to above, Mr. James Nasmyth has deposited therein his remarkable pictorial map of the Moon, and his other cartoons of the Lunar surface (seven in number), and these beautiful works of art now adorn the walls of the Lecture-room.

The staff of the University Observatory consists of two assistants—Mr. William E. Plummer, F.R.A.S., and Mr. Charles A. Jenkins, F.R.A.S.: these gentlemen have been attached thereto since its first institution, and their able co-operation has been repeatedly acknowledged by the present Director. There is also provided for the Observatory, a skilled mechanic, whose services are important to the general routine.

Independently of the original researches carried on in this Observatory, the instruction of the students in practical astronomy, and the delivery of various courses of lectures, are among the principal duties attached to the Institution.

The Observatory is, by University Statute, under the inspection of a Board of Visitors, consisting of—

The Vice-Chancellor of the University.
The Astronomer Royal (W. H. M. Christie, Esq., M.A., F.R.S.).
The Lowndean Professor of Astronomy, Cambridge (J. C. Adams, Esq., M.A., F.R.S.).
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W. Esson, Esq., M.A., F.R.S.
E. B. Elliott, Esq., M.A.

Through this Board an annual report is presented to the University in Convocation.

Oxford University Observatory,
1889, *August.*

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INTRODUCTION.

I. In the year 1878, I had been engaged in the investigation of the moon's physical libration by the aid of lunar photographs on collodion plates. In the course of this research a series of measures had to be taken for the determination of the lunar diameter. I found that the results possessed such delicacy and accordance, that the thought occurred to me of applying photography to the determination of stellar parallax. But for the prosecution of this design it became necessary to obtain the photographic images of faint stars with a few minutes exposure, a result which could not be accomplished on the ordinary wet plates. This difficulty was however removed by the adoption about that time of the processes of the more sensitive dry plate photography. This method easily renders evident the images of faint stars, and it is with reference to measures connected with such faint stars, that the very idea of parallactic determination necessarily depends.

II. In May, 1886, I communicated to the Royal Society a method of determining the magnitude of stars from the measures of their discs impressed on dry photographic plates, and of the suitability of photographic methods to the purposes of accurate measurement in general. These results were again so accordant that I at once commenced with confidence the necessary observations for the determination of stellar parallax. The star chosen for the first attempt was naturally 61 Cygni, on which Bessel had bestowed such extraordinary care, and whose measures have been generally confirmed by later astronomers. A comparison on an extended scale of the probable errors of measured distances on the photographic plates, with those obtained by Bessel with the Heliometer, would at once confirm or condemn the photographic process. Another cogent reason for the selection of this star arose from the fact of the existence of an undoubted orbital connection between its two components; for if the identity of the parallaxes of two stars thus relatively so close to each other with reference to a third, were independently established by photography, then there would be both furnished and satisfied a most crucial test of the applicability and accuracy of this method of investigation. But this photographic method of astronomical enquiry was so entirely novel, that I determined still further to exhibit its value, and accordingly as many as *four* faint stars of comparison were selected, and I proposed to determine the parallaxes of the two components with reference to each of the four stars. Thus there would be no less than eight independent determinations of the quantities which, at that time, I thought, would be practically identical.

III. A more enlarged experience has taught me that there is no necessary and *à priori* ground, for expecting the so-called parallax of a star to be

identical in amount with respect to any two other stars in the apparent vicinity, however faint. For recent researches have shown that the lustre of a star depends greatly on many other elements besides that of the distance at which it is viewed; and it must never be forgotten that the parallax obtained by Bessel's method, or by any variation of it, is not absolute, but is relative to the parallaxes of the stars of comparison employed. Attention will be drawn to this point in the sequel of these investigations, and it is here insisted on chiefly in order to modify the reasons for anticipating an identity in all the eight results referred to above.

IV. Notwithstanding this remark, it has been an almost unvaried practice in these researches to select four stars of comparison, suitably situated, instead of the usual one or two. For it is a peculiarity of the photographic method that it lends itself to the multiplication of data for measurement in the photographic field to an almost unlimited extent. Moreover, all these measures possess the great advantage of referring to the same instant of time, and they can also be made leisurely in the day time, without distraction or constraint, and, when necessary, can be repeated and examined at any distant intervals. But all these great advantages are on the assumption that the picture on the plate is and remains a perfect representation of the actuality in the heavens.

V. In order to satisfy myself on this important and fundamental point, an investigation of the amount of distortion of the field, at remoter distances from the axis of the telescope than are generally relied upon in observations, had been made, and the result is published in vol. xlvii. of the *Mem. Roy. Ast. Soc.* Extended experience has still further satisfied me of the reliability of the focal field up to the limits of the picture required. It remained therefore only to enquire, whether this reliable field is practically transferable to the photographic plate. Proof of this can only be had by the establishment of the identity of measurement of the visual picture with those made on the film. For this purpose I may refer to the communication in the *Proc. Roy. Soc. May*, 1886. Later enquiries made by other astronomers* have put this question altogether beyond reasonable doubt, and it is not necessary here to produce numerical data to support the fact.

VI. It was however still further necessary to establish the uniformity of the film with regard to its capacity for accurate measurement of wide extent and in every direction. A part of the same question is the enquiry whether measurements between the same stars on different plates, even if taken on different nights, were identical with each other. Repeated trials have satisfied me that there is no cause for the apprehension of inaccuracy in these directions, provided that suitable methods of reduction (to be explained hereafter) are employed in the discussion of the measures.

VII. Another necessary enquiry also presented itself, viz. as to whether the photographic film remained constant after a lapse of time. In order to test this question, the same plates were measured at dates separated by sufficiently wide intervals of time, and the difference between the two results was found not to exceed the errors of observation.

* Bulletin du Comité International permanent, *passim*.

VIII. Having thus discussed the general methods of the process, I proceed to explain the particular application of them to the determination of parallax, and this I feel compelled to do with a very considerable amount of detail, because the introduction of a new element of danger, viz. the effects of the possible inconstancy of the film, require to be very scrupulously examined, and the details to be very carefully described.

IX. The first step in the process is the selection of four stars of comparison suitable for the purpose. The suitability in question implies that two of the stars should be as nearly as possible in the same line with the star whose parallax is sought, and if possible at approximately equal distances therefrom. The other pair ought to satisfy similar conditions, but to be as nearly as convenient at right angles to the former direction. This condition of the picture may occasionally be satisfied by the inspection of Argelander's Charts, but in general it is found necessary to appeal to the heavens, by taking a picture of the district required. For this purpose it is necessary to select such stars of comparison as could generally be measurably impressed on the plate with an exposure not exceeding five minutes. This essential limitation of the time of exposure prevents in some cases the selection of stars of comparison rigidly fulfilling the conditions of configuration stated above. For from the very first it was felt that if an exposure considerably greater than five minutes was necessary to produce the required images, it would be impossible to mark the precise epoch of the formation of the image, and hence impossible accurately to eliminate the effects of refraction from the measures. Another reason for this limitation arose from the fact, that when a bright star such as that of the second magnitude was in question, a longer exposure than that mentioned would give so extended an image, that it would not be possible to bisect it with the accuracy required. For although it would be possible to employ means for temporarily covering the bright star during a part of the exposure required for the impression of the fainter stars, a question would always arise as to the accuracy of the process. Bearing this in view, I venture to digress so far as to record my gratification, that Dr. Elkin, by his admirable discussion of the parallaxes of stars of the first magnitude, has rendered it unnecessary for me to encounter the difficulties of photographic processes applied to such bright objects.

X. It is almost unnecessary to explain to astronomers that it is further desirable to select one pair of stars approximately in the direction of the axis major of the parallactic ellipse, or in other words, parallel to the ecliptic. This consideration will also modify the otherwise advisable condition of the rectangularity of the second pair referred to above.

XI. The selection of comparison stars being thus completed, the next step is to proceed to the more direct operations necessary to the production of the plates. The first step consists in determining the proper position of the photographic plate with reference to the mirror. Experience with the De La Rue instrument has shown, that the focal plane remains by no means at a constant distance from the mirror itself, as measured along the tube, and consequently it becomes necessary before commencing observations for the night, to find the best position of the plate by actual trial and development.

This preliminary trial also enables the observer to judge of the necessary duration of the exposure, for it is a well ascertained fact, that this necessary duration varies extremely from night to night.

XII. Having ascertained the proper position of the plate, the exposure was continued in general for about five minutes, or whatever other time had been indicated by the trial plate. Four plates were in general exposed as probably sufficing for a night's work on a particular star. After the development, which was carried no further than was necessary for the complete exhibition of all the star-images required, the four plates were submitted to measurement in the De La Rue Macromicrometer elsewhere described *. The plate was so inserted in this machine that the principal star coincided with the centre of the position circle attached thereto, this disposition of things being made in order to secure the use of the same portion of the screws in all the operations, thus eliminating the effects of any possible small irregularities in the screw itself. Notwithstanding this precaution the screw had been carefully examined by the method described by Bessel in the *Untersuchungen.* The result was to give as a correction (which however is quite insensible in its application)

$$\text{Horizontal screw} = -0''\cdot0022\sin u - 0''\cdot0066\cos u - 0''\cdot0044\sin 2u + 0''\cdot0003\cos 2u$$

$$\text{Vertical screw} = +0''\cdot0036\sin u + 0''\cdot0127\cos u - 0''\cdot0003\sin 2u + 0''\cdot0007\cos 2u.$$

It may be well to mention that in the course of the measurements a second examination of the screws was made, in order to detect any possible defects arising from usage. The new correction, like the old, is quite insensible.

Each of the eight distances was measured five times, and the mean of the measures on each plate was taken. Further, the diagonal distance between each pair of comparison stars was also independently measured on each plate. The absolute necessity of these diagonal measures, in order to connect the measures of the several plates into a consistent whole, will be explained hereafter.

Before proceeding to exhibit the detailed measures of 61 Cygni, it will be desirable to state the amount of accuracy with which the bisection of these star discs can be effected. The probable error of measurement naturally varies as the size of the disc increases.

For a disc	5″	in diameter	the Prob.	Error is	″ 0.08
„	10″	„	„	„	0.11
„	15″	„	„	„	0.12
„	20″	„	„	„	0.16
„	25″	„	„	„	0.17
„	30″	„	„	„	0.20.

Consequently the probable error of a measure of distance will be the square root of the sum of the squares of certain pairs of these quantities.

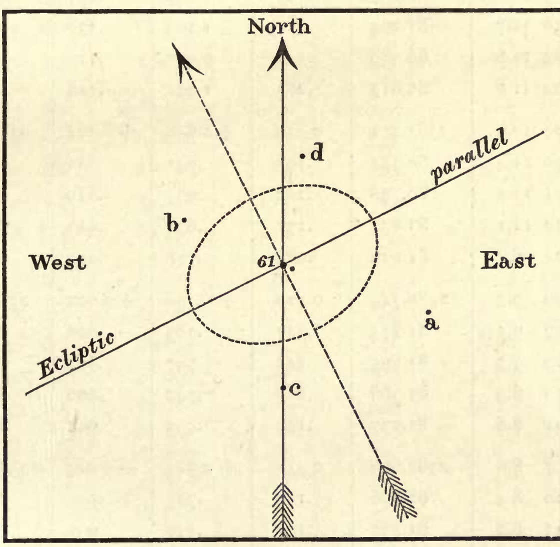
Preliminarily to all other computations, it is necessary to enquire if any correction must be made to the measures, on account of possible variation of

* Memoirs Royal Ast. Soc., vol. xlvii.

the film, and of the focal length of the mirror from night to night, or from plate to plate. It is on this account that the diagonal distances (*a*) to (*b*), (*c*) to (*d*), are to be regularly measured and tabulated. It is assumed that these actual diagonal distances are absolutely constant in the sky, and such would probably appear to be the case with the measures also, were it not for change in the film and focus. These changes in a presumably constant distance are to be transferred proportionately to the varying distances of the comparison stars from the principal star, and in this way it is presumed that imperfections in the film, or in the focus, or arising from any unknown cause, will be sensibly eliminated.

PARALLAX OF 61 *CYGNI.*

The accompanying figure is a diagram of the principal stars 61_1 and 61_2 Cygni with the comparison stars *a*, *b*; *c*, *d*: round the former is exhibited the



form and direction of the parallactic ellipse. The stars of comparison are designated by

a	D.M. 37°	No. 4189	Magnitude	7.9
b	„ 38	No. 4336	„	8.8
c	D.M. 37	No. 4175	„	9.0
d	„ 38	No. 4348	„	9.5

In Table I are exhibited the conditions under which the diagonal distance *a*, *b* was measured and the result of the necessary reductions freeing it from aberration and refraction, and consequently leading to the correction of the distances of the comparison stars from 61 Cygni, which result from unknown changes in the film, focus, &c.

TABLE I.

Measures of the (diagonal) distance of Star (a) *from Star* (b) *for the determination, at the times of exposure, of the correction to their measured distances from* 61_1 *and* 61_2 *Cygni.*

No. for Reference.	Date of Exposure of Plate. 1886.			Measured Distance of *a* to *b* in arc.	Average Deviation from the Mean.	Refraction.	Aberration.	Corrected Distance of *a* to *b*.	Difference from Assumed Mean.
		d.	h.	"	"	"	"	"	"
1	May	26	12.3	2379.026	......	+3·007	+0.146	......	......
2		28	11.9	80.335	0.414	1.445	.145	2381.925	+0.275
3		30	11.7	79.921	.353	1.812	.145	81.878	+0.322
4	June	1	11.7	81.009	.029	1.463	.145	82.617	−0.417
5		4	11.8	81.036	.174	1.316	.144	82.496	−0.296
6		8	11.9	2379.892	0.305	+1.199	+0.142	2381.233	+0.967
7		15	11.2	81.193	.193	1.295	.137	82.625	−0.425
8		16	11.7	81.204	.179	1.103	.136	82.443	−0.243
9		23	11.6	80.189	.326	0.997	.129	81.315	+0.885
10		24	11.6	81.813	.285	1.001	.128	82.942	−0.742
11		28	12.0	2381.471	0.329	+0.858	+0.124	2382.453	−0.253
12		30	11.4	80.435	.193	.941	.121	81.498	+0.702
13	July	1	11.3	80.798	.242	.937	.119	81.854	+0.346
14	Aug.	20	11.1	81.637	.137	.671	.019	82.327	−0.127
15		24	9.8	81.029	.089	.708	.009	81.746	+0.454
16		26	9.3	2380.745	0.329	+0.758	+0.004	2381.507	+0.693
17		28	9.5	81.273	.327	.703	− .001	81.975	+0.225
18		29	9.5	81.895	.243	.707	.004	82.598	−0.398
19		30	8.9	81.366	.292	.742	.006	82.102	+0.098
20		31	8.8	81.037	.136	.735	.008	81.764	+0.436
21	Sept.	7	8.6	2381.609	0.335	+0.724	−0.025	2382.308	−0.108
22		10	8.4	81.026	.183	.725	.027	81.724	+0.476
23		11	8.5	81.885	.209	.716	.035	82.566	−0.366
24		13	8.4	82.112	.364	.713	.040	82.785	−0.585
25		15	8.1	82.168	.057	.725	.045	82.848	−0.648
26		16	9.8	2380.803	0.175	+0.667	−0.046	2381.424	+0.776
27		17	8.1	82.052	.132	.720	.049	82.723	−0.523
28		18	8.0	81.938	.243	.723	.052	82.609	−0.409
29		20	9.0	81.012	.269	.672	.056	81.628	+0.572
30		22	9.4	81.884	.193	.668	.061	82.491	−0.291
31		27	10.2	2382.015	0.322	+0.693	−0.072	2382.636	−0.436
32		29	8.6	81.044	.386	.669	.076	81.637	+0.563
33		30	8.4	81.365	.244	.671	.079	81.957	+0.243
34	Oct.	2	8.2	81.616	.129	.674	.083	82.207	−0.007
35		6	9.1	81.548	.302	.673	.091	82.130	+0.070

No. for Reference.	Date of Exposure of Plate. 1886–7.			Measured Distance of *a* to *b* in arc.	Average Deviation from the Mean.	Refraction.	Aberration.	Corrected Distance of *a* to *b*.	Difference from Assumed Mean.
		d.	h.	"	"	"	"	"	"
36	Oct.	13	10.1	2381.630	0.193	+ 0.714	— 0.104	2382.240	— 0.040
37		21	7.5	81.759	.317	.667	.117	82.309	— 0.109
38		22	7.5	81.428	.242	.667	.119	81.976	+ 0.224
39	Nov.	3	6.6	81.642	.229	.669	.134	82.177	+ 0.023
40		5	8.8	81.740	.262	.740	.135	82.345	— 0.145
41		16	7.5	2382.057	0.098	+ 0.708	— 0.143	2382.622	— 0.422
42		17	8.3	81.517	.314	.754	.144	82.127	+ 0.073
43		18	8.6	81.866	.252	.781	.144	82.503	— 0.303
44		23	8.6	82.075	.173	.805	.145	82.735	— 0.535
45		29	6.9	81.589	.269	.717	.145	82.161	+ 0.039
46	Dec.	1	7.3	2381.458	0.325	+ 0.747	— 0.145	2382.060	+ 0.140
47		2	6.8	81.736	.155	.721	.145	82.312	— 0.112
48		4	6.4	82.040	.172	.708	.144	82.604	— 0.404
49		7	6.3	82.093	.249	.716	.143	82.666	— 0.466
50		9	7.2	82.034	.275	.781	.142	82.673	— 0.473
51		14	6.2	2382.749	0.302	+ 0.734	— 0.138	2383.345	— 1.145
52		16	6.2	82.946	.074	.747	.136	83.557	— 1.357
53		24	6.2	82.759	.183	.780	.129	83.410	— 1.210
54	87 Jan.	5	6.9	83.018	.265	.918	.111	83.825	— 1.625
55		8	6.4	82.437	.129	.877	.104	83.210	— 1.010
56		10	6.7	2381.126	0.210	+ 0.934	— 0.102	2381.959	+ 0.241
57		12	6.3	83.019	.133	.899	.099	83.819	— 1.619
58		20	6.4	82.630	.104	.969	.083	83.516	— 1.316
59		25	6.3	81.007	.309	.993	.072	81.928	+ 0.272
60		31	6.5	82.363	.240	1.066	.058	83.371	— 1.171
61	Feb.	5	6.0	2380.697	0.262	+ 1.047	— 0.048	2381.696	+ 0.504
62		8	5.9	82.052	.405	1.069	.038	83.083	— 0.883
63		17	17.1	80.629	.193	2.464	— .014	83.079	— 0.879
64		25	17.4	80.093	.271	1.816	+ .005	81.914	+ 0.286
65		26	16.9	80.558	.322	2.134	.008	82.700	— 0.500
66		27	16.9	2378.930	0.262	+ 2.221	+ 0.010	2381.161	+ 1.039
67	Mar.	12	16.1	80.054	.313	2.053	.043	82.150	+ 0.050
68		16	15.7	80.655	.280	2.133	.052	82.840	— 0.640
69		23	16.4	80.964	.092	1.390	.068	82.422	— 0.222
70		27	14.8	79.370	.147	2.314	.077	81.761	+ 0.439
71	Apr.	2	15.3	2380.059	0.209	+ 1.563	+ 0.089	2381.711	+ 0.489
72		16	14.4	79.198	.322	1.559	.114	80.871	+ 1.329
73		19	14.6	81.328	.153	1.407	.118	82.853	— 0.653
74		20	15.0	80.301	.205	1.249	.119	81.669	+ 0.531
75		25	13.4	80.515	.164	1.901	.127	82.543	— 0.343

No. for Reference.	Date of Exposure of Plate. 1887.	Measured Distance of a to b in arc.	Average Deviation from the Mean.	Refraction.	Aberration.	Corrected Distance of a to b.	Difference from Assumed Mean.
	d. h.	″	″	″	″	″	″
76	Apr. 26 14.2	2380.797	0.243	+ 1.390	+ 0.128	2382.315	− 0.115
77	29 13.8	80.575	.312	1.520	.131	82.226	− 0.026
78	30 13.8	80.584	.279	1.474	.132	82.190	+ 0.010
79	May 5 13.7	81.230	.080	1.362	.137	82.729	− 0.529
80	7 13.0	80.784	.153	1.597	.139	82.520	− 0.320
81	9 12.4	2380.167	0.302	+ 1.984	+ 0.140	2382.291	− 0.091
82	10 12.8	80.893	.155	1.647	.140	82.680	− 0.480
83	13 13.0	81.584	.242	1.429	.142	83.155	− 0.955
84	14 12.8	81.415	.270	1.517	.143	83.085	− 0.885
85	16 12.8	81.470	.129	1.442	.144	83.056	− 0.856
86	18 12.8	2381.172	0.362	+ 1.371	+ 0.144	2382.687	− 0.487
87	20 13.1	81.328	.193	1.199	.145	82.672	− 0.472
88	26 13.2	80.954	.204	1.075	.146	82.175	+ 0.025
89	31 11.8	80.369	.247	1.444	.144	81.957	+ 0.243

Column 1 contains the number for reference to the Notes which are here, for convenience, deferred to the end of Table VII.

Column 2 is the date of the exposure of the plates. Here it is necessary to refer back to § IX. in the Introduction: the remarks there being taken into the account, it is here only necessary to state that the epoch of exposure is taken at one minute before the removal of the plate from the instrument: the exposures necessary for the production of a measurable disc were not in all cases uniformly the same, but were on the average about five minutes. See § XI. of the Introduction. Any considerable departures from the five minutes exposure are mentioned in the Notes. It was considered that the real visible formation of the photographic discs of the faint stars occurred about one minute before their completion. It is unnecessary further to enlarge on the effects of the epoch of exposure on the refraction; these considerations indicate the desirability of using the most sensitive plates procurable.

Column 3. The distance of (a) from (b) was measured on each of the four plates by means of five bisections of each of the star discs. The same part of the screw was always used for the reasons given in § XII.

Column 4. I have here preferred an average deviation of the twenty measures from their mean to the more usual quantity, termed 'probable error,' as bearing a more precise and significant meaning. The mean of all these average deviations through the whole series of distance in this Table is 0″.231.

Column 5 is the effect of refraction on the measured distance of a from b. The usual form, here adopted, is that originally given by Bessel

$$ds = k.s\,\{1 + \cos^2(p-\eta)\tan^2 z\}.$$

Column 6 gives the correction to the measured distance in order to remove the effects of Aberration. The quantities inserted in this Table have been computed from the expression originally due to Bessel's investigation:

$$ds = \{aA + bB\}$$

where A and B are taken from the Nautical Almanac, and

$$a = -\frac{s}{206265}\left[\tan\epsilon \sin\delta + \cos\delta \sin\alpha\right]$$

$$b = \frac{s}{206265}\cos\delta\cos\alpha.$$

Column 7 is derived from column 3 by the algebraical addition of the last two terms. The discrepancies in these final and adopted measures are very noticeable. Differences in the unknown proper motions of (a) and (b) and also some possible difference of their parallaxes might account for some very trifling differences here, were it not that there are no signs of periodicity discernible. It is therefore necessary to attribute these apparent variations of distance to changes in the film, and in the inconstant position of the plates in regard to the focal plane. Another consideration is that the practical difficulty of accurately adjusting the photographic plate to the focus of the mirror for the moment is formidable, and accompanied with a greater amount of uncertainty than is the case with an ordinary refracting telescope. Further, these effects are cumulative over long distances. An alteration of 0.1 inch in the focal length will affect the distance here measured by $1''.9$.

Column 8. For the computations of this column, which refer to the correction to be made to the measured distances on the photographic plates, owing to the various causes of distortion already described, the process adopted is as follows. After a considerable number of plates have been measured and corrected for refraction and aberration, the mean of the whole is taken and assumed to represent the true distance and to remain constant throughout the year. It might have been more logical to have completed the whole measures for the year, and to have then taken the average for the year, but no sensible increase of accuracy would have resulted from the delay. The constant quantity assumed for the distance of a from b was $2382''.20$. It is moreover to be observed that after the solution of the Normal Equations, this distance can be computed with greater accuracy. In the present instance this diagonal distance so derived is $2382''.295$. This is the mean of the two determinations from 61_1 and 61_2 Cygni. With the above explanation it will be seen that these quantities are obtained by subtracting column 7 from $2382''.20$.

TABLE II.

Adopted measures of 61_1 Cygni from the comparison Star (a).

No. for Reference.	Date of Exposure of Plate. 1886.			Measured Distance of Star (*a*) to 61_1 Cygni.	Refraction Correction.	Aberration Correction.	Proper Motion.	Correction to Scale.	Concluded Distance of Star (*a*) from 61_1 Cygni.	Average Deviation.
		d.	h.	″	″	″	″	″	″	″
1	May	26	12.3	1379.984	+ 1.686	+ 0.084	− 1.733	......	1380.021	0.162
2		28	11.9	80.731	0.843	.084	1.717	+ 0.159	80.100	.293
3		30	11.7	80.462	1.039	.084	1.704	+ .186	80.067	.317
4	June	1	11.7	81.030	0.852	.084	1.685	− .241	80.040	.274
5		4	11.8	81.013	0.759	.083	1.662	− .171	80.022	.183
6		8	11.9	1380.371	+ 0.687	+ 0.082	− 1.630	+ 0.560	1380.070	0.275
7		15	11.2	81.006	.741	.080	1.575	− .246	80 006	.139
8		16	11.7	81.263	.631	.079	1.567	− .141	80.265	.167
9		23	11.6	80.597	.572	.075	1.512	+ .512	80.244	.129
10		24	11.6	81.574	.581	.074	1.504	− .430	80.295	.246
11		28	12.0	1381.298	+ 0.494	+ 0.072	− 1.473	− 0.146	1380.245	0.304
12		30	11.4	80.836	.540	.070	1.457	+ .406	80.395	.243
13	July	1	11.3	80.893	.552	.069	1.449	+ .200	80.265	.225
14	Aug.	20	11.1	81.421	.389	.011	1.052	− .074	80.695	.274
15		24	9.8	80.884	.409	.005	1.024	+ .263	80.537	.257
16		26	9.3	1380.713	+ 0.422	+ 0.002	− 1.008	+ 0.401	1380.530	0.136
17		28	9.5	81.024	.410	− .001	0.992	+ 0.130	80.571	.293
18		29	9.5	81.351	.407	.002	0.984	− .230	80.543	.264
19		30	8.9	81.178	.428	.004	0.977	+ .057	80.682	.170
20		31	8.8	80.960	.425	.005	0.969	+ .252	80.663	.125
21	Sept.	7	8.6	1381.112	+ 0.418	− 0.015	− 0.914	− 0.063	1380.538	0.183
22		10	8.4	80.873	.417	.016	.890	+ .276	80.660	.196
23		11	8.5	81.375	.415	.020	.882	− .212	80.676	.304
24		13	8.4	81.501	.411	.023	.867	− .339	80.683	.242
25		15	8.1	81.558	.418	.026	.851	− .377	80.722	.137
26		16	9.8	1380.869	+ 0.385	− 0.027	− 0.842	+ 0.449	1380.834	0.205
27		17	8.1	81.366	.418	.028	.835	− .303	80.618	.311
28		18	8.0	81.352	.414	.030	.827	− .237	80.672	.083
29		20	9.0	81.074	.391	.033	.811	+ .321	80.942	.096
30		22	9.4	81.291	.385	.035	.795	− .168	80.678	.147
31		27	10.2	1381.209	+ 0.396	− 0.042	− 0.755	− 0.252	1380.556	0.207
32		29	8.6	80.667	.388	.044	.740	+ .326	80.597	.093
33		30	8.4	80.933	.389	.046	.732	+ .141	80.685	.127
34	Oct.	2	8.2	81.009	.390	.048	.716	− .004	80.631	.309
35		6	9.1	80.986	.389	.053	.685	+ .041	80.678	.146

No. for Reference.	Date of Exposure of Plate. 1886–7.			Measured Distance of Star (*a*) to 61_1 Cygni.	Refraction Correction.	Aberration Correction.	Proper Motion.	Correction to Scale.	Concluded Distance of Star (*a*) from 61_1 Cygni.	Average Deviation.
		d.	h.	″	″	″	″	″	″	″
36	Oct.	13	10.1	1381.101	+ 0.428	− 0.060	− 0.629	− 0.023	1380.817	0.242
37		21	7.5	81.141	.385	.068	.567	− .063	80.828	.183
38		22	7.5	80.901	.385	.069	.559	+ .130	80.788	.192
39	Nov.	3	6.6	80.990	.385	.077	.465	+ .013	80.846	.107
40		5	8.8	81.006	.428	.079	.448	− .084	80.823	.130
41		16	7.5	1380.897	+ 0.412	− 0.083	− 0.362	− 0.244	1380.620	0.264
42		17	8.3	80.583	.442	.083	.354	+ .042	80.630	.302
43		18	8.6	80.818	.458	.084	.346	− .175	80.671	.093
44		23	8.6	80.848	.476	.084	.306	− .310	80.624	.129
45		29	6.9	80.629	.417	.084	.260	+ .023	80.725	.064
46	Dec.	1	7.3	1380.523	+ 0.436	− 0.084	− 0.244	+ 0.081	1380.712	0.093
47		2	6.8	80.741	.420	.084	.236	− .065	80.776	.129
48		4	6.4	80.885	.412	.084	.221	− .234	80.758	.175
49		7	6.3	80.885	.418	.083	.213	− .270	80.737	.242
50		9	7.2	80.907	.458	.082	.181	− .274	80.828	.206
51		14	6.2	1381.222	+ 0.428	− 0.080	− 0.142	− 0.662	1380.766	0.122
52		16	6.2	81.093	.434	.079	.126	− .785	80.537	.149
53		24	6.2	80.843	.456	.074	− .063	− .701	80.461	.274
54	87 Jan.	5	6.9	80.985	.546	.064	+ .034	− .941	80.563	.076
55		8	6.4	80.572	.519	.061	.057	− .585	80.502	.230
56		10	6.7	1379.711	+ 0.555	− 0.059	+ 0.073	+ 0.141	1380.421	0.163
57		12	6.3	80.559	.537	.059	.089	− .937	80.191	.204
58		20	6.4	80.451	.585	.048	.152	− .762	80.378	.079
59		25	6.3	79.357	.600	.042	.191	+ .158	80.264	.083
60		31	6.5	80.047	.663	.033	.239	− .678	80.238	.302
61	Feb.	5	6.0	1379.059	+ 0.642	− 0.028	+ 0.270	+ 0.292	1380.231	0.205
62		8	5.9	79.963	0.658	.022	.302	− .511	80.390	.173
63		17	17.1	78.907	1.405	− .008	.376	− .509	80.171	.164
64		25	17.4	78.541	1.034	+ .003	.439	+ .166	80.183	.207
65		26	16.9	78.758	1.222	.004	.447	− .290	80.141	.198
66		27	16.9	1377.715	+ 1.264	+ 0.006	+ 0.455	+ 0.602	1380.042	0.204
67	Mar.	12	16.1	78.234	1.182	.025	.557	+ .029	80.027	.075
68		16	15.7	78.582	1.223	.030	.589	− .371	80.053	.133
69		23	16.4	78.671	0.795	.040	.644	− .129	80.021	.196
70		27	14.8	77.803	1.326	.045	.675	+ .254	80.103	.244
71	Apr.	2	15.3	1378.017	+ 0.931	+ 0.052	+ 0.723	+ 0.283	1380.006	0.124
72		16	14.4	77.502	0.927	.066	.833	+ .764	80.092	.173
73		19	14.6	78.695	0.805	.068	.856	− .378	80.046	.262
74		20	15.0	78.239	0.697	.069	.864	+ .307	80.176	.085
75		25	13.4	78.243	1.091	.073	.904	− .199	80.112	.131

No. for Reference.	Date of Exposure of Plate. 1887.			Measured Distance of Star (*a*) to 61_1 Cygni.	Refraction Correction.	Aberration Correction.	Proper Motion.	Correction to Scale.	Concluded Distance of Star (*a*) from 61_1 Cygni.	Average Deviation.
		d.	h.	$''$	$''$	$''$	$''$	$''$	$''$	$''$
76	Apr.	26	14.2	1378.372	+0.795	+0.074	+0.911	−0.067	1380.085	0.243
77		29	13.8	78.222	.864	.076	.935	− .015	80.082	.271
78		30	13.8	78.181	.845	.077	.942	+ .006	80.051	.265
79	May	5	13.7	78.616	.782	.079	.982	− .306	80.153	.209
80		7	13.0	78.206	.927	.080	0.998	− .185	80.026	.162
81		9	12.4	1378.013	+1.140	+0.081	+1.013	−0.053	1380.194	0.097
82		10	12.8	78.244	.938	.081	1.021	− .278	80.006	.035
83		13	13.0	78.646	.815	.082	1.045	− .553	80.035	.126
84		14	12.8	78.429	.866	.083	1.053	− .512	79.919	.204
85		16	12.8	78.492	.825	.083	1.068	− .496	79.972	.135
86		18	12.8	1378.205	+0.785	+0.084	+1.084	−0.282	1379.876	0.207
87		20	13.1	78.412	.687	.084	1.100	− .273	80.010	.132
88		26	13.2	78.215	.616	.084	1.147	+ .014	80.076	.205
89		31	11.8	77.857	.825	.083	1.187	+ .141	80.093	.077

The preceding Table (Table II) applies to the measures of the distance of the comparison star (*a*) from the principal star; and, after what has been said already by way of explanation of Table I, it is unnecessary to make any further remarks regarding the first five columns of Table II. Column 6 gives the proper motion of the principal star reckoned in the direction of the star of comparison, in order to reduce the measures to the common epoch 1887, Jan. 1. The annual proper motion of 61 Cygni has been assumed to be, after examination from various sources, that given in the Standard Stars of Prof. S. Newcomb, viz.

$$\text{in R.A.} \quad +0^{s}.3484$$
$$\text{in } \delta \quad +3''.2312$$

equivalent to a motion of $5''.2264$ in a great circle inclined at $51^\circ\ 48'$ to the parallel of declination, and this quantity has been reduced in the direction of the star of comparison.

Column 7 contains the necessary corrections to the foregoing measures, on account of the various causes of irregularity already referred to when treating of the diagonal measures. The amount of correction applied is proportional to the measured distance, on the scale that the total amount of correction inserted in column 8 of the last Table is applicable to the distance of $2382''.20$. For instance on 1886, May 28, the correction made

$$= \frac{1380''.3}{2382.2} \times +0''.275 = +0''.159$$

which is the number inserted in the column now being described. It is here confidently assumed that all irregularities depending on the distance measured

are virtually corrected hereby, whether the causes are known or unknown, and hence no separate corrections are applied for temperature, either at the time of measurement, or at the time of exposure. Having regard to the variety and amount of some of these corrections, it might have been feared that they would have been fatal to the ultimate value obtained for the parallax. On the other hand the frequent changes of sign have a tendency to remove the apprehension. In order to ascertain the real effect of the correction in question, the parallax was computed both with and without it. The result of the computation was that though there was no material difference in the total amount of π, on the other hand, the residuals in the equations of condition were very seriously affected, even to ten times the present amount, introducing of course a proportional theoretical uncertainty in this value. The final conclusion is that the corrections in question are both real and absolutely necessary. Nevertheless it does occasionally happen that the measures of one or other of the stars do show glaring and enormous discrepancies from the remainder of the series. Sometimes such evident deviations from the general accuracy can be traced to some mechanical injury of the film, but at others can only be supposed to arise from some local distortion, the cause of which cannot be traced. It has been the practice to reject all measures on a plate *thus* abnormally disfigured, and the cases of such rejection (which do not amount to 3 per cent. of the whole) will be found mentioned in the notes.

Column 8 speaks for itself, as being the concluded value of the distance of star (*a*) from 61_1 Cygni, obtained by the application of the small corrections, contained in the last four columns, and, when slightly modified, forms the independent term in the equations of condition.

Column 9 is the correlative of column 4 in Table I, to which the same remarks apply. The mean of the whole series is $0''.182$.

TABLE III.

Equations of Condition formed from the measures of 61_1 Cygni and Star (a).

No.	Date, 1886.	Equations of Condition.	Residual.
	d. h.	$''$	$''$
1	May 26 12.3	$-0.329 = x - 0.7029\,\pi - 0.6018\,d\mu$	$+0.037$
2	28 11.9	$-\ .250 = x - \ .6827 \quad - \ .5961$	$-\ .043$
3	30 11.7	$-\ .283 = x - \ .6628 \quad - \ .5918$	$.000$
4	June 1 11.7	$-\ .310 = x - \ .6420 \quad - \ .5853$	$+\ .046$
5	4 11.8	$-\ .328 = x - \ .6088 \quad - \ .5771$	$+\ .078$
6	8 11.9	$-0.280 = x - 0.5625 \quad - 0.5660$	$+0.051$
7	15 11.2	$-\ .344 = x - \ .4759 \quad - \ .5469$	$+\ .153$
8	16 11.7	$-\ .085 = x - \ .4627 \quad - \ .5442$	$-\ .101$
9	23 11.6	$-\ .106 = x - \ .3685 \quad - \ .5250$	$-\ .038$
10	24 11.6	$-\ .055 = x - \ .3545 \quad - \ .5223$	$-\ .083$

No.	Date, 1886.			Equations of Condition.	Residual.
		d.	h.	$''$	$''$
11	June	28	12.0	$-0.105 = x - 0.2979\,\pi - 0.5114\,d\mu$	-0.008
12		30	11.4	$+\ .045 = x - \ .2692 - \ .5059$	$-\ .145$
13	July	1	11.3	$-\ .085 = x - \ .2546 - \ .5031$	$-\ .009$
14	Aug.	20	11.1	$+\ .345 = x + \ .4753 - \ .3653$	$-\ .019$
15		24	9.8	$+\ .187 = x + \ .5250 - \ .3556$	$+\ .061$
16		26	9.3	$+0.180 = x + 0.5491 - 0.3501$	$+0.079$
17		28	9.5	$+\ .221 = x + \ .5729 - \ .3445$	$+\ .048$
18		29	9.5	$+\ .193 = x + \ .5851 - \ .3418$	$+\ .081$
19		30	8.9	$+\ .332 = x + \ .5955 - \ .3392$	$-\ .052$
20		31	8.8	$+\ .313 = x + \ .6067 - \ .3364$	$-\ .029$
21	Sept.	7	8.6	$+0.188 = x + 0.6807 - 0.3174$	$+0.129$
22		10	8.4	$+\ .310 = x + \ .7096 - \ .3091$	$+\ .019$
23		11	8.5	$+\ .326 = x + \ .7186 - \ .3064$	$+\ .007$
24		13	8.4	$+\ .333 = x + \ .7363 - \ .3009$	$+\ .009$
25		15	8.1	$+\ .372 = x + \ .7531 - \ .2955$	$-\ .023$
26		16	9.8	$+0.484 = x + 0.7617 - 0.2925$	-0.131
27		17	8.1	$+\ .268 = x + \ .7697 - \ .2900$	$+\ .088$
28		18	8.0	$+\ .322 = x + \ .7767 - \ .2872$	$+\ .037$
29		20	9.0	$+\ .592 = x + \ .7924 - \ .2815$	$-\ .225$
30		22	9.4	$+\ .328 = x + \ .8057 - \ .2761$	$+\ .045$
31		27	10.2	$+0.206 = x + 0.8359 - 0.2623$	$+0.181$
32		29	8.6	$+\ .247 = x + \ .8458 - \ .2570$	$+\ .144$
33		30	8.4	$+\ .335 = x + \ .8506 - \ .2543$	$+\ .058$
34	Oct.	2	8.2	$+\ .281 = x + \ .8592 - \ .2488$	$+\ .118$
35		6	9.1	$+\ .328 = x + \ .8739 - \ .2380$	$+\ .076$
36		13	10.1	$+0.467 = x + 0.8896 - 0.2185$	-0.055
37		21	7.5	$+\ .478 = x + \ .8914 - \ .1969$	$-\ .065$
38		22	7.5	$+\ .438 = x + \ .8905 - \ .1942$	$-\ .025$
39	Nov.	3	6.6	$+\ .496 = x + \ .8583 - \ .1615$	$-\ .095$
40		5	8.8	$+\ .473 = x + \ .8487 - \ .1557$	$-\ .076$
41		16	7.5	$+0.270 = x + 0.7808 - 0.1257$	$+0.100$
42		17	8.3	$+\ .280 = x + \ .7730 - \ .1229$	$+\ .087$
43		18	8.6	$+\ .321 = x + \ .7651 - \ .1201$	$+\ .042$
44		23	8.6	$+\ .274 = x + \ .7220 - \ .1064$	$+\ .072$
45		29	6.9	$+\ .375 = x + \ .6636 - \ .0904$	$-\ .054$
46	Dec.	1	7.3	$+0.362 = x + 0.6420 - 0.0847$	-0.050
47		2	6.8	$+\ .426 = x + \ .6316 - \ .0820$	$-\ .118$
48		4	6.4	$+\ .408 = x + \ .6093 - \ .0766$	$-\ .110$
49		7	6.3	$+\ .387 = x + \ .5743 - \ .0739$	$-\ .104$
50		9	7.2	$+\ .478 = x + \ .5494 - \ .0628$	$-\ .204$

No.	Date, 1886–7.			Equations of Condition.	Residual.
		d.	h.	$''$	$''$
51	Dec.	14	6.2	$+0.416 = x + 0.4862\,\pi - 0.0492\,d\mu$	-0.170
52		16	6.2	$+ .187 = x + .4599 - .0438$	$+ .049$
53		24	6.2	$+ .111 = x + .3484 - .0219$	$+ .078$
54	87 Jan.	5	6.9	$+ .213 = x + .1683 + .0118$	$- .099$
55		8	6.4	$+ .152 = x + .1222 + .0198$	$+ .058$
56		10	6.7	$+0.071 = x + 0.0909 + 0.0253$	$+0.010$
57		12	6.3	$- .159 = x + .0600 + .0308$	$+ .228$
58		20	6.4	$+ .028 = x - .0654 + .0527$	$- .012$
59		25	6.3	$- .086 = x - .1440 + .0664$	$- .068$
60		31	6.5	$- .112 = x - .2360 + .0829$	$+ .056$
61	Feb.	5	6.0	$-0.119 = x - 0.3098 + 0.0938$	$+0.032$
62		8	5.9	$+ .040 = x - .3538 + .1048$	$- .146$
63		17	17.1	$- .179 = x - .4838 + .1306$	$+ .019$
64		25	17.4	$- .167 = x - .5845 + .1526$	$- .035$
65		26	16.9	$- .209 = x - .5961 + .1553$	$+ .002$
66		27	16.9	$-0.308 = x - 0.6076 + 0.1581$	$+0.097$
67	Mar.	12	16.1	$- .323 = x - .7400 + .1935$	$+ .057$
68		16	15.7	$- .297 = x - .7736 + .2044$	$- .017$
69		23	16.4	$- .329 = x - .8236 + .2236$	$+ .029$
70		27	14.8	$- .247 = x - .8464 + .2344$	$- .063$
71	Apr.	2	15.3	$-0.344 = x - 0.8736 + 0.2509$	$+0.023$
72		16	14.4	$- .258 = x - .9006 + .2891$	$- .072$
73		19	14.6	$- .304 = x - .8997 + .2973$	$+ .025$
74		20	15.0	$- .174 = x - .8989 + .3000$	$- .155$
75		25	13.4	$- .238 = x - .8910 + .3137$	$- .087$
76		26	14.2	$-0.265 = x - 0.8884 + 0.3165$	-0.059
77		29	13.8	$- .268 = x - .8798 + .3246$	$- .052$
78		30	13.8	$- .299 = x - .8765 + .3272$	$- .019$
79	May	5	13.7	$- .197 = x - .8556 + .3410$	$- .111$
80		7	13.0	$- .324 = x - .8458 + .3465$	$- .020$
81		9	12.4	$-0.156 = x - 0.8349 + 0.3519$	-0.143
82		10	12.8	$- .344 = x - .8290 + .3546$	$+ .150$
83		13	13.0	$- .315 = x - .8099 + .3628$	$- .028$
84		14	12.8	$- .431 = x - .8032 + .3655$	$+ .147$
85		16	12.8	$- .378 = x - .7890 + .3710$	$+ .100$
86		18	12.8	$-0.474 = x - 0.7736 + 0.3765$	$+0.203$
87		20	13.1	$- .340 = x - .7576 + .3820$	$- .076$
88		26	13.2	$- .274 = x - .7042 + .3984$	$+ .034$
89		31	11.8	$- .257 = x - .6547 + .4120$	$+ .038$

Table III contains the 89 equations of condition from which the Parallax is to be deduced. The Parallax in distance, as computed from Bessel's expression (demonstrated in the Appendix) is

$$Rm \cos (M - \odot)\, \pi$$

where $\quad m \cos M = \sin a \sin P + \cos a \sin \delta \cos P.$

$$m \sin M = (-\cos a \sin P + \sin a \sin \delta \cos P) \cos \omega - \cos \delta \cos P \sin \omega,$$

and if P be assumed 108° 26′ this expression becomes

$$R\,[9.95260] \cos (206^\circ\, 8' - \odot)\, \pi$$

where R = the Earth's Radius Vector:
and $\odot$ = the Sun's Longitude, both at the time of exposure.

Again if $\delta\mu$ be the unknown small correction required to the assumed annual proper motion (μ) in the direction of distance, this term multiplied by the fraction of year will enter into the equations of condition. Lastly, since

$$\text{Concluded Distance} = \text{True Distance } (x) + A\,\pi + B\,d\mu$$

if from each side of the equation a constant be removed, in this instance 1380″.350, there will result the equations of condition in a convenient form for computation. In this way Table III has been formed.

Before solving this Table by the usual method, it should be stated that a term (κ) depending on a presumed difference of aberration of the two stars has not been inserted. Presumably, there can be little question but that there may be a difference in the coefficient of aberration on account of the varied conditions of the stars themselves. If this difference be taken into the account the equations of condition become altered by the insertion of a term,

$$m' \sin (\odot - M')\, \kappa,$$

but on mature reflection, it is seen that the alteration in the coefficient of aberration would be so slight, that *à priori* no appreciable effect would result in the value of π. To set this question at rest, I had recourse to Sir R. Ball's computation for the parallax of 61 Cygni, where this term is taken into the account. The result, according to Sir R. Ball, is an alteration of 0″.03, amounting to $\frac{1}{600}$ of the whole constant of aberration. Now the actual correction to the measured distances rarely exceeds 0″.1, so that the distances would not be altered by more than $\frac{1}{6000}$ of a second of arc.

As a matter of fact the value of π deduced from Dr. Ball's equations of condition, neglecting the term, is changed from 0″.4659 to 0″.4461, whereas, on the other hand, the weight of π is increased from 4.887 to 7.057. Similar results are derived from a similar enquiry based on the parallactic computations of Prof. Asaph Hall. On these grounds I regard it as desirable to omit all consideration of any presumed change in the aberration constant.

Further, it will be observed that no inequalities of weight have been assigned to the various equations of condition, for it was felt that any such inequality of weight must be connected with physical variations of the film and the images impressed thereon. At first sight the varying values in columns 5 and 9 of Tables I and II might appear to indicate the varying security in the equations of condition themselves, and would furnish the means of deriving the necessary multipliers to bring them into greater uniformity. On the other hand, it will be found that measures taken on the same parts of the plate are affected by

very different errors, and that therefore any multipliers introduced for the purpose of establishing uniformity in the measurements on the plate would be utterly inconsistent. The supplementary Table IV (page 18) has been drawn up in order to show at a glance that the variations in measuring in the same direction and on the same plate are purely accidental and do not depend upon the condition of the film.

In this Table (III) the last column contains the residuals arising from the introduction of the values obtained of the unknown quantities, and I am induced to regard them as exceptionally small, and with a felicitous succession of changes of sign, justifying a high degree of confidence in a novel method which has now been for the first time put upon its trial on a very considerable scale.

The normal equations have been formed after the usual method and are as follows:—

$$
\begin{array}{rcrrr}
+\ 3''.1520 & = & +89.0000\,x & -7.3917\,d\mu & -\ 0.1710\,\pi \\
-\ 3.1737 & = & -\ 7.3917 & +8.8384 & -\ 9.0374 \\
+17.2577 & = & -\ 0.1710 & -9.0374 & -41.2547
\end{array}
$$

whence are derived the following results—

$$
\begin{aligned}
x &= +0''.0406 \\
d\mu &= +0.0514 \\
\pi &= +0.4294.
\end{aligned}
$$

The quantity expressed by the symbol x is of no practical importance, for it depends mainly on the somewhat arbitrary assumption that the distance between the two diagonal stars is $2382''.20$. A similar remark may be made as to any physical significance in the quantity $\delta\,\mu$, inasmuch as it here depends upon months, whereas to be of value it should be measured by years. I have therefore not concerned myself with any determination of a theoretical probable error of either of these quantities which, under the circumstances, may be properly regarded as illusory.

Very different is the case with the value of π, being in reality the sole and final object of this investigation. For the present it will be sufficient to add that its probable error is $0''.0162$, so that with reference to star (*a*)

$$\pi = 0''.4294 \pm 0''.0162.$$

Further, the probable error of the resulting measures derived from four plates, by this method of treatment, on the same night is $\pm 0''.091$.

It is here interesting to remark in passing, and especially as appertaining to a method so novel as the present, that Bessel's probable error is practically identical with that here stated. So far then as the present results are concerned, they may be regarded as expressing an equality of accuracy between the photographic and Bessel's Heliometer measures; the great advantage in point of convenience and rapidity in the multiplication of observations is on the side of photography.

TABLE IV (*Supplementary*).

The 'Average deviation' derived from all the measures on the same plates for one night.

Date, 1886.	$a-b.$	$61_1-a.$	$61_2-a.$	$61_1-b.$	$61_2-b.$	$c-d.$	$61_1-c.$	$61_2-c.$	$61_1-d.$	$61_2-d.$
	″	″	″	″	″	″	″	″	″	″
May 30	0.353	0.317	0.096	0.133	0.132	0.305	0.203	0.283	0.262	0.092
June 1	.029	.274	.342	.301	.137	.211	.135	.296	.133	.188
4	.174	.183	.183	.252	.293	.243	.139	.049	.157	.240
8	.305	.275	.202	.096	.087	.092	.296	.176	.159	.183
15	.193	.139	.134	.074	.165	.136	.087	.091	.097	.136
16	0.179	0.167	0.127	0.165	0.193	0.274	0.243	0.207	0.247	0.274
23	.326	.129	.296	.283	.242	.381	.113	.170	.225	.225
24	.285	.246	.079	.224	.302	.115	.295	.183	.303	.243
28	.329	.304	.104	.130	.085	......	......	......	......	......
30	.193	.243	.120	.245	.225	.144	.187	.242	.085	.211
July 1	0.242	0.225	0.243	0.137	0.138	0.202	0.220	0.270	0.162	0.096
Aug. 20	.137	.274	.225	.217	.243	.150	.164	.135	.139	.243
24	.089	.257	.262	.144	.262	.309	.244	.206	.192	.164
26	.329	.136	.239	.209	.113	.371	.311	.209	.157	.175
28	.327	.293	.136	.093	.270	.244	.246	.139	.244	.190
29	0.243	0.264	0.074	0.062	0.126	0.262	0.087	0.224	0.209	0.151
30	.292	.170	.092	.147	.163	.203	.162	.242	.250	.206
31	.136	.125	.177	.243	.192	.135	.207	.265	.133	.264
Sept. 7	.335	.183	.250	.128	.247	.129	.138	.129	.182	.083
10	.183	.196	.139	.253	.103	.322	.192	.143	.209	.320

Parallax of 61_2 *Cygni and Star* (a).

I now proceed to a similar discussion of the parallax of the second component of 61 Cygni, with regard to the same star of comparison (a). Very sufficient reasons for adopting the somewhat unusual course of investigating the parallax not only of a star, but also of its close companion, will be found on reference to II. of the Introduction.

The Tables are in all respects, *mutatis mutandis*, analogous to those already described, the measurements of the same diagonal distance referring to both components. This being the case, no further description is required, and the Tables are given consecutively without additional comment; the respective headings of each column are sufficient indication of their meaning.

TABLE V.

Concluded measures of 61_2 *Cygni from the comparison Star* (a).

No. for Reference.	Date of Exposure of Plate. 1886.			Measured Distance of Star (a) to 61_2 Cygni.	Refraction Correction.	Aberration Correction.	Proper Motion.	Correction to Scale.	Concluded Distance of Star (a) from 61_2 Cygni.	Average Deviation.
		d.	h.	"	"	"	"	"	"	"
1	May	26	12.3	1359.790	+ 1.657	+ 0.083	− 1.727	......	1359·803	0.172
2		28	11.9	60.439	0.827	.083	1.711	+ 0.157	59.795	.225
3		30	11.7	60.196	1.019	.083	1.699	+ .184	59.783	.096
4	June	1	11.7	60.901	0.836	.083	1.680	− .238	59.902	.342
5		4	11.8	60.710	0.745	.082	1.656	− .169	59.712	.183
6		8	11.9	1360.086	+ 0.675	+ 0.081	− 1.624	+ 0.552	1359.770	0.202
7		15	11.2	60.783	.728	.078	1.570	− .243	59.776	.134
8		16	11.7	60.837	.621	.078	1.562	− .139	59.835	.127
9		23	11.6	60.160	.563	.074	1.507	+ .505	59.795	.296
10		24	11.6	61.178	.572	.073	1.499	− .424	59.900	.079
11		28	12.0	1361.063	+ 0.485	+ 0.071	− 1.468	− 0.144	1360.007	0.104
12		30	11.4	60.463	.532	.069	1.452	+ .401	60.013	.120
13	July	1	11.3	60.786	.534	.068	1.444	+ .198	60.142	.243
14	Aug.	20	11.1	61.112	.383	.011	1.048	− .073	60.385	.225
15		24	9.8	60.534	.402	.005	1.020	+ .259	60.180	.262
16		26	9.3	1360.306	+ 0.416	+ 0.002	− 1.005	+ 0.396	1360.115	0.239
17		28	9.5	60.749	.403	− .001	0.989	+ .128	60.290	.136
18		29	9.5	60.917	.400	.002	0.981	− .227	60.107	.074
19		30	8.9	60.846	.422	.004	0.973	+ .056	60.347	.092
20		31	8.8	60.638	.419	.005	0.965	+ .249	60.336	.177
21	Sept.	7	8.6	1360.971	+ 0.412	− 0.015	− 0.911	− 0.062	1360.395	0.250
22		10	8.4	60.628	.411	.015	.887	+ .272	60.409	.139
23		11	8.5	61.117	.409	.020	.879	− .209	60.418	.192
24		13	8.4	61.142	.403	.023	.863	− .334	60.325	.097
25		15	8.1	61.267	.412	.026	.848	− .370	60.435	.146
26		16	9.8	1360.480	+ 0.381	− 0.026	− 0.839	+ 0.443	1360.439	0.312
27		17	8.1	61.009	.409	.028	.832	− .299	60.259	.242
28		18	8.0	61.109	.404	.030	.824	− .234	60.425	.193
29		20	9.0	60.710	.383	.032	.808	+ .327	60.580	.209
30		22	9.4	61.015	.381	.035	.792	− .166	60.403	.254
31		27	10.2	1360.869	+ 0.391	− 0.041	− 0.753	− 0.249	1360.217	0.177
32		29	8.6	60.309	.382	.044	.738	+ .321	60.230	.202
33		30	8.4	60.698	.383	.045	.730	+ .139	60.445	.317
34	Oct.	2	8.2	60.713	.383	.047	.714	− .004	60.331	.075
35		6	9.1	60.812	.382	.052	.683	+ .040	60.499	.146

No. for Reference.	Date of Exposure of Plate. 1886–7.			Measured Distance of Star (a) to 61_2 Cygni.	Refraction Correction.	Aberration Correction.	Proper Motion.	Correction to Scale.	Concluded Distance of Star (a) from 61_2 Cygni.	Average Deviation.
		d.	h.	″	″	″	″	″	″	″
36	Oct.	13	10.1	1360.720	+0.425	−0.059	−0.627	−0.023	1360.436	0.207
37		21	7.5	60.831	.381	.067	.565	− .062	60.518	.093
38		22	7.5	60.631	.381	.068	.557	+ .128	60.515	.152
39	Nov.	3	6.6	60.551	.381	.076	.463	+ .013	60.406	.133
40		5	8.8	60.647	.425	.077	.447	− .083	60.465	.246
41		16	7.5	1360.669	+0.407	−0.082	−0.360	−0.241	1360.393	0.262
42		17	8.3	60.324	.439	.082	.353	+ .042	60.370	.305
43		18	8.6	60.428	.455	.082	.345	− .173	60.283	.129
44		23	8.6	60.666	.472	.083	.305	− .305	60.445	.173
45		29	6.9	60.290	.413	.083	.259	+ .022	60.383	.156
46	Dec.	1	7.3	1360.285	+0.434	−0.083	−0.243	+0.080	1360.473	0.135
47		2	6.8	60.411	.416	.083	.235	− .064	60.445	.182
48		4	6.4	60.557	.407	.083	.220	− .231	60.430	.129
49		7	6.3	60.530	.413	.082	.212	− .266	60.383	.244
50		9	7.2	60.640	.454	.081	.180	− .270	60.563	.283
51		14	6.2	1361.026	+0.425	−0.079	−0.141	−0.653	1360.578	0.272
52		16	6.2	60.792	.431	.078	.126	− .775	60.244	.225
53		24	6.2	60.633	.454	.073	−0.063	− .691	60.260	.279
54	87 Jan.	5	6.9	60.791	.546	.064	+0.034	− .928	60.379	.093
55		8	6.4	60.376	.519	.061	+0.057	− .577	60.314	.128
56		10	6.7	1359.461	+0.555	−0.058	+0.073	+0.138	1360.169	0.200
57		12	6.3	60.640	.535	.056	.088	− .925	60.282	.144
58		20	6.4	60.187	.585	.047	.151	− .751	60.125	.207
59		25	6.3	59.097	.601	.041	.191	+ .155	60.003	.093
60		31	6.5	59.915	.664	.033	.238	− .669	60.115	.160
61	Feb.	5	6.0	1358.902	+0.640	−0.027	+0.269	+0.288	1360.072	0.205
62		8	5.9	59.605	0.657	.022	.301	− .504	60.037	.302
63		17	17.1	58.780	1.393	− .008	.374	− .502	60.037	.142
64		25	17.4	58.371	1.019	+ .003	.438	+ .163	59.994	.190
65		26	16.9	58.635	1.203	.004	.446	− .286	60.002	.085
66		27	16.9	1357.632	+1.248	+0.006	+0.454	+0.593	1359.933	0.073
67	Mar.	12	16.1	58.190	1.164	.024	.555	+ .029	59.962	.240
68		16	15.7	58.413	1.206	.030	.586	− .365	59.870	.262
69		23	16.4	58.380	0.780	.039	.641	− .127	59.713	.135
70		27	14.8	57.543	1.309	.044	.673	+ .251	59.820	.156
71	Apr.	2	15.3	1357.739	+0.915	+0.051	+0.720	+0.279	1359.704	0.093
72		16	14.4	57.116	.911	.065	.830	+ .759	59.681	.240
73		19	14.6	58.379	.790	.067	.853	− .373	59.716	.222
74		20	15.0	57.793	0.683	.068	.861	+ .303	59.708	.174
75		25	13.4	57.876	1.071	.072	.900	− .196	59.723	.139

No. for Reference.	Date of Exposure of Plate. 1887.			Measured Distance of Star (*a*) to 61_2 Cygni.	Refraction Correction.	Aberration Correction.	Proper Motion.	Correction to Scale.	Concluded Distance of Star (*a*) from 61_2 Cygni.	Average Deviation.
		d.	h.	"	"	"	"	"	"	"
76	Apr.	26	14.2	1357.972	+0.780	+0.073	+0.908	−0.066	1359.667	0.153
77		29	13.8	57.879	.850	.075	.930	− .015	59.719	.180
78		30	13.8	57.793	.829	.075	.939	+ .006	59.642	.127
79	May	5	13.7	58.105	.768	.078	.979	− .303	59.627	.242
80		7	13.0	57.923	.910	.079	.994	− .183	59.723	.270
81		9	12.4	1358.532	+1.118	+0.080	+1.010	−0.052	1359.688	0.304
82		10	12.8	58.033	.920	.080	1.017	− .275	59.775	.262
83		13	13.0	58.513	.800	.081	1.041	− .546	59.889	.153
84		14	12.8	58.199	.851	.081	1.049	− .506	59.674	.190
85		16	12.8	58.213	.808	.082	1.065	− .490	59.688	.185
86		18	12.8	1358.113	+0.769	+0.082	+1.080	−0.279	1359.765	0.204
87		20	13.1	58.213	.675	.083	1.096	− .270	59.797	.135
88		26	13.2	57.884	.600	.083	1.144	+ .014	59.725	.157
89		31	11.8	57.506	.808	.082	1.182	+ .139	59.717	.172

TABLE VI.

Equations of Condition formed from the measures of 61_2 *Cygni and Star* (a).

No.	Date, 1886.			Equations of Condition.	Residual.
		d.	h.	"	"
1	May	26	12.3	$-0.197 = x - 0.7022\,\pi - 0.6018\,d\mu$	−0.035
2		28	11.9	$-\ .205 = x -\ .6820 -\ .5961$	− .018
3		30	11.7	$-\ .217 = x -\ .6621 -\ .5918$	+ .003
4	June	1	11.7	$-\ .098 = x -\ .6413 -\ .5853$	− .107
5		4	11.8	$-\ .288 = x -\ .6080 -\ .5771$	+ .098
6		8	11.9	$-0.230 = x - 0.5617 - 0.5660$	+0.060
7		15	11.2	$-\ .224 = x -\ .4751 -\ .5469$	+ .092
8		16	11.7	$-\ .165 = x -\ .4619 -\ .5442$	+ .039
9		23	11.6	$-\ .205 = x -\ .3676 -\ .5250$	+ .120
10		24	11.6	$-\ .100 = x -\ .3536 -\ .5223$	+ .022
11		28	12.0	$+0.007 = x - 0.2971 - 0.5114$	−0.061
12		30	11.4	$+\ .013 = x -\ .2684 -\ .5059$	− .054
13	July	1	11.3	$+\ .142 = x -\ .2538 -\ .5031$	− .177
14	Aug.	20	11.1	$+\ .385 = x +\ .4758 -\ .3653$	− .101
15		24	9.8	$+\ .180 = x +\ .5255 -\ .3556$	+ .127

No.	Date, 1886–7.			Equations of Condition.	Residual.
		d.	h.	″	″
16	Aug.	26	9.3	$+0.115 = x + 0.5496\ \pi - 0.3501\ d\mu$	+0.201
17		28	9.5	$+\ .290 = x + \ .5733 - \ .3445$	+ .037
18		29	9.5	$+\ .107 = x + \ .5855 - \ .3418$	+ .225
19		30	8.9	$+\ .347 = x + \ .5959 - \ .3392$	− .010
20		31	8.8	$+\ .336 = x + \ .6071 - \ .3364$	+ .006
21	Sept.	7	8.6	$+0.395 = x + 0.6810 - 0.3174$	−0.021
22		10	8.4	$+\ .409 = x + \ .7099 - \ .3091$	− .021
23		11	8.5	$+\ .418 = x + \ .7189 - \ .3064$	− .026
24		13	8.4	$+\ .325 = x + \ .7365 - \ .3009$	+ .074
25		15	8.1	$+\ .435 = x + \ .7533 - \ .2955$	− .029
26		16	9.8	$+0.439 = x + 0.7617 - 0.2925$	−0.028
27		17	8.1	$+\ .259 = x + \ .7700 - \ .2900$	+ .155
28		18	8.0	$+\ .425 = x + \ .7769 - \ .2872$	− .008
29		20	9.0	$+\ .580 = x + \ .7926 - \ .2815$	− .156
30		22	9.4	$+\ .403 = x + \ .8059 - \ .2761$	+ .028
31		27	10.2	$+0.217 = x + 0.8360 - 0.2623$	+0.227
32		29	8.6	$+\ .230 = x + \ .8458 - \ .2570$	+ .219
33		30	8.4	$+\ .445 = x + \ .8506 - \ .2543$	+ .005
34	Oct.	2	8.2	$+\ .331 = x + \ .8592 - \ .2488$	+ .124
35		6	9.1	$+\ .499 = x + \ .8739 - \ .2380$	− .038
36		13	10.1	$+0.436 = x + 0.8894 - 0.2185$	+0.034
37		21	7.5	$+\ .518 = x + \ .8911 - \ .1969$	− .046
38		22	7.5	$+\ .515 = x + \ .8902 - \ .1942$	− .044
39	Nov.	3	6.6	$+\ .406 = x + \ .8579 - \ .1615$	+ .064
40		5	8.8	$+\ .465 = x + \ .8482 - \ .1557$	− .009
41		16	7.5	$+0.393 = x + 0.7803 - 0.1257$	+0.037
42		17	8.3	$+\ .370 = x + \ .7724 - \ .1229$	+ .056
43		18	8.6	$+\ .283 = x + \ .7645 - \ .1201$	+ .140
44		23	8.6	$+\ .445 = x + \ .7214 - \ .1064$	− .040
45		29	6.9	$+\ .383 = x + \ .6629 - \ .0904$	− .001
46	Dec.	1	7.3	$+0.473 = x + 0.6413 - 0.0847$	−0.101
47		2	6.8	$+\ .445 = x + \ .6309 - \ .0820$	− .056
48		4	6.4	$+\ .430 = x + \ .6087 - \ .0766$	− .070
49		7	6.3	$+\ .383 = x + \ .5738 - \ .0739$	− .038
50		9	7.2	$+\ .563 = x + \ .5486 - \ .0628$	− .228
51		14	6.2	$+0.578 = x + 0.4855 - 0.0492$	−0.268
52		16	6.2	$+\ .244 = x + \ .4592 - \ .0438$	+ .054
53		24	6.2	$+\ .260 = x + \ .3476 - \ .0219$	− .009
54	87 Jan.	5	6.9	$+\ .379 = x + \ .1675 + \ .0118$	− .201
55		8	6.4	$+\ .314 = x + \ .1214 + \ .0198$	− .156

No.	Date, 1887.	d.	h.	Equations of Condition.	Residual.
				$''$	$''$
56	Jan.	10	6.7	$+0.169 = x + 0.0901\,\pi + 0.0253\,d\mu$	+0.024
57		12	6.3	$+\ .282 = x +\ .0592 +\ .0308$	− .149
58		20	6.4	$+\ .125 = x -\ .0662 +\ .0527$	− .036
59		25	6.3	$+\ .003 = x -\ .1447 +\ .0664$	+ .054
60		31	6.5	$+\ .115 = x -\ .2366 +\ .0829$	− .106
61	Feb.	5	6.0	$+0.072 = x - 0.3104 + 0.0938$	−0.093
62		8	5.9	$+\ .037 = x -\ .3544 +\ .1048$	+ .076
63		17	17.1	$+\ .037 = x -\ .4845 +\ .1306$	+ .130
64		25	17.4	$-\ .006 = x -\ .5850 +\ .1526$	− .129
65		26	16.9	$+\ .002 = x -\ .5965 +\ .1553$	− .142
66		27	16.9	$-0.067 = x - 0.6080 + 0.1581$	+0.077
67	Mar.	12	16.1	$-\ .038 = x -\ .7403 +\ .1935$	− .161
68		16	15.7	$-\ .130 = x -\ .7738 +\ .2044$	− .082
69		23	16.4	$-\ .287 = x -\ .8237 +\ .2236$	+ .055
70		27	14.8	$-\ .180 = x -\ .8466 +\ .2344$	− .062
71	Apr.	2	15.3	$-0.296 = x - 0.8736 + 0.2509$	+0.044
72		16	14.4	$-\ .319 = x -\ .9003 +\ .2891$	+ .057
73		19	14.6	$-\ .284 = x -\ .8996 +\ .2973$	+ .066
74		20	15.0	$-\ .292 = x -\ .8986 +\ .3000$	+ .075
75		25	13.4	$-\ .277 = x -\ .8906 +\ .3137$	+ .063
76		26	14.2	$-0.333 = x - 0.8881 + 0.3165$	+0.120
77		29	13.8	$-\ .281 = x -\ .8796 +\ .3246$	− .030
78		30	13.8	$-\ .358 = x -\ .8761 +\ .3272$	+ .109
79	May	5	13.7	$-\ .373 = x -\ .8552 +\ .3410$	+ .134
80		7	13.0	$-\ .277 = x -\ .8453 +\ .3465$	− .042
81		9	12.4	$-0.312 = x - 0.8344 + 0.3519$	+0.082
82		10	12.8	$-\ .225 = x -\ .8285 +\ .3546$	− .002
83		13	13.0	$-\ .111 = x -\ .8093 +\ .3628$	− .108
84		14	12.8	$-\ .326 = x -\ .8026 +\ .3655$	+ .110
85		16	12.8	$-\ .312 = x -\ .7884 +\ .3710$	+ .102
86		18	12.8	$-0.235 = x - 0.7731 + 0.3765$	+0.032
87		20	13.1	$-\ .203 = x -\ .7570 +\ .3820$	− .007
88		26	13.2	$-\ .275 = x -\ .7035 +\ .3484$	+ .103
89		31	11.8	$-\ .283 = x -\ .6540 +\ .4120$	+ .133

The normal equations derived from these equations of condition by the ordinary method are as follows:—

$$
\begin{aligned}
+\ 8''.8480 &= +89.0000x - 7.3917\,d\mu - \ 0.1556\,\pi \\
-\ 4.0289 &= -\ \ 7.3917 \quad + 8.8384 \quad -\ 9.0391 \\
+16.9205 &= -\ \ 0.1556 \quad - 9.0391 \quad +41.2537
\end{aligned}
$$

whence

$$x = +0''.1056$$
$$d\mu = +0.0659$$
$$\pi = +0.4250$$

while the probable error of $\pi = 0''.0176$, and the probable error in the determination of a distance of the principal star from the star of comparison is $0''.100$.

Before entering upon the tabular statement connected with the second star of comparison, it may be well to give as a matter of interest, but which may be passed over if regarded as superfluous, a table exhibiting the difference of the measures of the two components from the same star, it being borne in mind that the measures and their reductions are independent. It will be seen that the average difference of the measures is $20''.287$. An interesting use of this result will be found on page 66.

TABLE VII.

Difference of the measured distances of Star (a) *from* 61_1 *and* 61_2 *Cygni.*

No.	Difference of Measure.	Difference from Mean.	No.	Difference of Measure.	Difference from Mean.	No.	Difference of Measure.	Difference from Mean.
	"	"		"	"		"	"
1	20.218	0.069	21	20.143	0.144	41	20.227	0.060
2	.305	.018	22	.251	.036	42	.260	.027
3	.284	.003	23	.258	.029	43	.388	.101
4	.138	.149	24	.358	.071	44	.179	.108
5	.310	.023	25	.287	.000	45	.342	.055
6	20.300	0.013	26	20.395	0.108	46	20.239	0.048
7	.230	.057	27	.359	.072	47	.331	.044
8	.430	.143	28	.247	.040	48	.328	.041
9	.449	.162	29	.362	.075	49	.354	.067
10	.395	.108	30	.275	.012	50	.265	.022
11	20.238	0.049	31	20.339	0.052	51	20.188	0.099
12	.382	.095	32	.367	.080	52	.293	.006
13	.123	.164	33	.240	.047	53	.201	.086
14	.310	.023	34	.300	.013	54	.184	.103
15	.357	.070	35	.179	.108	55	.188	.099
16	20.415	0.128	36	20.381	0.094	56	20.252	0.035
17	.281	.006	37	.310	.023	57	.009	.278
18	.436	.149	38	.273	.014	58	.253	.034
19	.335	048	39	.440	.153	59	.261	.026
20	.327	.040	40	.358	.071	60	.123	.164

No.	Difference of Measure.	Difference from Mean.	No.	Difference of Measure.	Difference from Mean.	No.	Difference of Measure.	Difference from Mean.
	″	″		″	″		″	″
61	20.159	0.128	71	20.302	0.015	81	20.506	0.221
62	.353	.066	72	.411	.124	82	.231	.056
63	.134	.153	73	.330	.043	83	.146	.143
64	.189	.098	74	.468	.181	84	.245	.042
65	.139	.148	75	.389	.102	85	.284	.003
66	20.109	0.178	76	20.418	0.131	86	20.111	0.176
67	.065	.222	77	.373	.086	87	.213	.074
68	.183	.104	78	.409	.122	88	.351	.064
69	.308	.021	79	.526	.239	89	.376	.089
70	.283	.004	80	.303	.016			

The intention of the foregoing Table (VII) is to exhibit, from another point of view, the accuracy of the measures.

NOTES.

No. 1. The exposure was only two minutes, and the fainter stars are not visible.
No. 2. On this night the stars *c* and *d*, were too faintly impressed to be measurable.
No. 6. Images elongated, but measurable.
No. 11. Cloudy, and images faint: those of *c* and *d* are visible on only one plate, and the measures of these stars have not been retained.
No. 18. One of the plates rejected from injury to the film.
No. 23. Exposure was continued for eight minutes.
No. 30. Cloudy: images feeble.
No. 35. One of the plates rejected on account of obviously discordant measures.
No. 41. Images elongated, but measurable.
No. 49. Exposure was continued for ten minutes, on account of fog.
No. 53. Plates 'fogged': one plate rejected, accidentally damaged.
No. 54. Instrument imperfectly driven.
No. 55. Bright moonlight: plates somewhat fogged: exposure ten minutes.
No. 61. Altitude low: images feeble.
No. 66. One of the plates rejected: measures very discordant.
No. 70. Images elongated. Driving-clock went badly. (Oil congealed.)
No. 72. Clouds passing. Exposures of variable length.
No. 76. One of the plates rejected through accident to the film.
No. 81. Images faint.
No. 83. Images elongated: one of the plates rejected owing to discordant measures.
No. 85. Exposure continued through ten minutes.
No. 88. Images faint and elongated.

The total number of plates rejected is eight: the total number taken is 332.

RELATIVE PARALLAX OF 61_1 *CYGNI AND STAR* (B).

Here again a similar arrangement of the Tables for the discussion of the parallax with this star is pursued, and the same diagonal of reference is still employed. It is only necessary to mention that the parallactic factors in the equations of condition have been computed from the expression

$$R\,[0.94438]\cos(\odot - 21^\circ\ 37')\,\pi.$$

TABLE VIII.

Concluded measures of 61_1 Cygni from the comparison Star (b).

No. for Reference.	Date of Exposure of Plate. 1886.			Measured Distance of Star (*b*) to 61_1 Cygni.	Refraction Correction.	Aberration Correction.	Proper Motion.	Correction to Scale.	Concluded Distance of Star (*b*) from 61_1 Cygni.	Average Deviation.
		d.	h.	"	"	"	"	"	"	"
1	May	28	11.9	1001.578	+0.633	+0.061	+1.502	+0.116	1003.890	0.124
2		30	11.7	1.354	.763	.061	1.489	+ .136	3.803	.133
3	June	1	11.7	1.940	.635	.061	1.475	− .176	3.935	.301
4		4	11.8	2.153	.568	.060	1.454	− .125	4.110	.252
5		8	11.9	1.716	.512	.060	1.426	+ .407	4.121	.096
6		15	11.2	1002.275	+0.554	+0.058	+1.378	−0.179	1004.086	0.074
7		16	11.7	2.297	.469	.057	1.371	− .102	4.092	.165
8		23	11.6	1.517	.424	.055	1.323	− .373	3.692	.283
9		24	11.6	2.196	.426	.054	1.316	− .312	3.680	.224
10		28	12.0	2.166	.364	.052	1.288	− .107	3.763	.130
11		30	11.4	1001.611	+0.400	+0.051	+1.275	+0.296	1003.633	0.245
12	July	1	11.3	1.938	.403	.050	1.268	+ .146	3.805	.137
13	Aug.	20	11.1	2.182	.283	.008	0.920	− .053	3.340	.217
14		24	9.8	1.931	.298	.004	.896	+ .191	3.320	.144
15		26	9.3	1.900	.309	.002	.882	+ .292	3.385	.209
16		28	9.5	1002.432	+0.299	−0.001	+0.868	+0.095	1003.693	0.093
17		29	9.5	2.446	.301	.002	.861	− .168	3.438	.062
18		30	8.9	2.254	.314	.003	.855	+ .041	3.461	.147
19		31	8.8	2.150	.315	.003	.848	+ .184	3.494	.243
20	Sept.	7	8.6	2.270	.306	.011	.800	− .045	3.320	.128
21		10	8.4	1002.044	+0.306	−0.011	+0.779	+0.200	1003.318	0.253
22		11	8.5	2.323	.303	.015	.772	− .154	3.229	.139
23		13	8.4	2.424	.299	.017	.758	− .246	3.218	.290
24		15	8.1	2.521	.306	.019	.744	− .273	3.279	.182
25		16	9.8	1.891	.281	.019	.737	+ .327	3.217	.247
26		17	8.1	1002.616	+0.303	−0.020	+0.731	−0.220	1003.410	0.229
27		18	8.0	2.486	.302	.022	.724	− .172	3.318	.270
28		20	9.0	2.104	.284	.024	.709	+ .241	3.314	.193
29		22	9.4	2.506	.281	.026	.696	− .123	3.334	.147
30		27	10.2	2.536	.286	.030	.661	− .184	3.269	.225
31		29	8.6	1002.122	+0.283	−0.032	+0.648	+0.237	1003.258	0.207
32		30	8.4	2.505	.283	.033	.641	+ .102	3.498	142
33	Oct.	2	8.2	2.523	.284	.035	.627	− .003	3.396	.263
34		6	9.1	2.357	.282	.038	.600	+ .030	3.231	.135
35		13	10.1	2.602	.304	.044	.550	− .017	3.395	.193

No. for Reference.	Date of Exposure of Plate. 1886–7.			Measured Distance of Star (*b*) to 61_1 Cygni.	Refraction Correction.	Aberration Correction.	Proper Motion.	Correction to Scale.	Concluded Distance of Star (*b*) from 61_1 Cygni.	Average Deviation.
		d.	h.	"	"	"	"	"	"	"
36	Oct.	21	7.5	1002.754	+0.281	−0.049	+0.496	−0.046	1003.436	0.252
37		22	7.5	2.572	.281	.050	.489	+ .094	3.386	.129
38	Nov.	3	6.6	2.784	.282	.056	.407	+ .010	3.427	.093
39		5	8.8	2.758	.304	.057	.392	− .061	3.336	.134
40		16	7.5	2.898	.295	.060	.317	− .178	3.272	.276
41		17	8.3	1002.840	+0.312	−0.060	+0.310	+0.031	1003.433	0.229
42		18	8.6	2.838	.320	.061	.302	− .128	3.271	.274
43		23	8.6	3.125	.331	.061	.268	− .225	3.438	.139
44		29	6.9	2.830	.297	.061	.228	+ .016	3.310	.183
45	Dec.	1	7.3	2.741	.309	.061	.214	+ .058	3.261	.205
46		2	6.8	1003.056	+0.299	−0.061	+0.207	−0.047	1003.454	0.039
47		4	6.4	3.097	.295	.061	.193	− .170	3.354	.172
48		7	6.3	3.258	.297	.060	.186	− .196	3.485	.144
49		9	7.2	3.241	.320	.060	.158	− .199	3.460	.193
50		14	6.2	3.733	.304	.058	.124	− .482	3.621	.260
51		16	6.2	1003.925	+0.308	−0.057	+0.110	−0.571	1003.715	0.211
52		24	6.2	3.711	.320	.054	+ .055	− .509	3.523	.183
53	87 Jan.	5	6.9	4.133	.367	.047	− .030	− .684	3.739	.151
54		8	6.4	3.859	.355	.045	.050	− .425	3.694	.204
55		10	6.7	3.187	.372	.043	.064	+ .101	3.553	.096
56		12	6.3	1004.288	+0.362	−0.041	−0.078	−0.682	1003.849	0.162
57		20	6.4	4.034	.385	.035	.133	− .554	3.697	.305
58		25	6.3	3.502	.392	.030	.167	+ .115	3.812	.183
59		31	6.5	4.198	.416	.024	.209	− .493	3.888	.175
60	Feb.	5	6.0	3.441	.409	.020	.236	+ .212	3.806	.244
61		8	5.9	1003.999	+0.415	−0.016	−0.264	−0.372	1003.762	0.105
62		17	17.1	3.347	1.081	− .006	.329	− .370	3.723	.149
63		25	17.4	3.276	0.784	+ .002	.385	+ .120	3.797	.173
64		26	16.9	3.486	.930	.003	.391	− .211	3.817	.126
65		27	16.9	3.014	.963	.004	.398	+ .437	4.020	.293
66	Mar.	12	16.1	1003.616	+0.894	+0.018	−0.487	+0.021	1004.062	0.272
67		16	15.7	3.837	0.924	.022	.515	− .269	3.999	.185
68		23	16.4	4.159	0.596	.029	.563	− .093	4.128	.304
69		27	14.8	3.506	1.015	.032	.591	+ .185	4.147	.242
70	Apr.	2	15.3	3.698	0.703	.038	.632	+ .206	4.013	.167
71		16	14.4	1003.437	+0.701	+0.048	−0.729	+0.568	1004.025	0.218
72		19	14.6	4.346	.604	.050	.749	− .275	3.976	.153
73		20	15.0	4.060	.533	.050	.756	+ .224	4.111	.227
74		25	13.4	3.914	.819	.053	.790	− .144	3.852	.244
75		26	14.2	4.168	.596	.054	.797	− .048	3.973	.131

No. for Reference.	Date of Exposure of Plate. 1887.			Measured Distance of Star (*b*) to 61_1 Cygni.	Refraction Correction.	Aberration Correction.	Proper Motion.	Correction to Scale.	Concluded Distance of Star (*b*) from 61_1 Cygni.	Average Deviation.
		d.	h.	"	"	"	"	"	"	"
76	Apr.	29	13.8	1004.133	+0.652	+0.055	−0.818	−0.011	1004.011	0.205
77		30	13.8	4.263	.624	.056	.825	+ .004	4.122	.190
78	May	5	13.7	4.402	.584	.058	.859	− .223	3.962	.133
79		7	13.0	4.303	.701	.058	.873	− .135	4.054	.307
80		9	12.4	4.153	.859	.059	.887	− .038	4.146	.185
81		10	12.8	1004.422	+0.708	+0.059	−0.893	−0.202	1004.094	0.262
82		13	13.0	4.800	.612	.060	.914	− .402	4.156	.105
83		14	12.8	4.741	.652	.060	.921	− .373	4.159	.240
84		16	12.8	4.693	.619	.060	.935	− .360	4.077	.183
85		18	12.8	4.701	.588	.061	.949	− .205	4.196	.235
86		20	13.1	1004.696	+0.512	+0.061	−0.963	−0.199	1004.107	0.208
87		26	13.2	4.447	.457	.061	1.004	+ .011	3.972	.265
88		31	11.8	4.213	.618	.061	1.038	+ .102	3.956	.133

TABLE IX.

Equations of Condition formed from the measures of 61_1 *Cygni and Star* (b).

No.	Date, 1886.			Equations of Condition.				Residual.
		d.	h.	"				"
1	May	28	11.9	+0.190	= x	+0.6213 π	−0.5961 $d\mu$	+0.079
2		30	11.7	+ .103	= x	+ .5999	− .5908	+ .157
3	June	1	11.7	+ .235	= x	+ .5788	− .5853	+ .015
4		4	11.8	+ .410	= x	+ .5489	− .5771	− .173
5		8	11.9	+ .421	= x	+ .4946	− .5660	− .208
6		15	11.2	+0.386	= x	+0.4051	−0.5469	−0.212
7		16	11.7	+ .392	= x	+ .3935	− .5442	− .223
8		23	11.6	− .008	= x	+ .2958	− .5250	+ .134
9		24	11.6	− .020	= x	+ .2818	− .5223	+ .139
10		28	12.0	+ .063	= x	+ .2245	− .5114	+ .031
11		30	11.4	−0.067	= x	+0.1956	−0.5059	+0.148
12	July	1	11.3	+ .105	= x	+ .1811	− .5031	− .030
13	Aug.	20	11.1	− .360	= x	− .5247	− .3653	+ .124
14		24	9.8	− .380	= x	− .5707	− .3556	+ .124
15		26	9.3	− .315	= x	− .5929	− .3501	+ .049

No.	Date, 1886–7.	d.	h.	Equations of Condition.				Residual.
				″				″
16	Aug.	28	9.5	−0.007	= x	−0.6150 π	−0.3445 $d\mu$	−0.268
17		29	9.5	− .262	= x	− .6257	− .3418	− .018
18		30	8.9	− .239	= x	− .6352	− .3392	− .045
19		31	8.8	− .206	= x	− .6454	− .3364	− .078
20	Sept.	7	8.6	− .380	= x	− .7118	− .3174	+ .064
21		10	8.4	−0.382	= x	−0.7373	−0.3091	+0.053
22		11	8.5	− .471	= x	− .7450	− .3064	+ .138
23		13	8.4	− .482	= x	− .7605	− .3009	+ .142
24		15	8.1	− .421	= x	− .7747	− .2955	+ .065
25		16	9.8	− .483	= x	− .7822	− .2925	+ .134
26		17	8.1	−0.290	= x	−0.7890	−0.2900	−0.062
27		18	8.0	− .382	= x	− .7950	− .2872	+ .027
28		20	9.0	− .386	= x	− .8078	− .2815	+ .031
29		22	9.4	− .366	= x	− .8187	− .2761	− .001
30		27	10.2	− .431	= x	− .8429	− .2623	+ .056
31		29	8.6	−0.442	= x	−0.8505	−0.2570	+0.064
32		30	8.4	− .202	= x	− .8541	− .2543	− .178
33	Oct.	2	8.2	− .304	= x	− .8604	− .2488	− .078
34		6	9.1	− .469	= x	− .8700	− .2380	+ .082
35		13	10.1	− .305	= x	− .8769	− .2185	− .085
36		21	7.5	−0.264	= x	−0.8692	−0.1969	−0.122
37		22	7.5	− .314	= x	− .8671	− .1942	− .071
38	Nov.	3	6.6	− .273	= x	− .8206	− .1615	− .092
39		5	8.8	− .364	= x	− .8097	− .1557	+ .004
40		16	7.5	− .428	= x	− .7311	− .1257	+ .103
41		17	8.3	−0.267	= x	−0.7224	−0.1229	−0.054
42		18	8.6	− .429	= x	− .7138	− .1201	+ .111
43		23	8.6	− .262	= x	− .6665	− .1064	− .035
44		29	6.9	− .390	= x	− .6037	− .0904	+ .122
45	Dec.	1	7.3	− .439	= x	− .5808	− .0847	+ .181
46		2	6.8	−0.246	= x	−0.5698	−0.0820	−0.006
47		4	6.4	− .346	= x	− .5463	− .0766	+ .104
48		7	6.3	− .215	= x	− .5097	− .0739	− .011
49		9	7.2	− .240	= x	− .4838	− .0628	+ .026
50		14	6.2	− .079	= x	− .4184	− .0492	− .106
51		16	6.2	+0.015	= x	−0.3914	−0.0438	−0.188
52		24	6.2	− .177	= x	− .2779	− .0219	+ .053
53	87 Jan.	5	6.9	+ .039	= x	− .0974	+ .0118	− .083
54		8	6.4	− .006	= x	− .0518	+ .0198	− .018
55		10	6.7	− .147	= x	− .0209	+ .0253	+ .137

No.	Date, 1887.			Equations of Condition.				Residual.
		d.	h.	″				″
56	Jan.	12	6.3	+0.149	= x	+0.0096 π	+0.0308 $d\mu$	−0.145
57		20	6.4	− .003	= x	+ .1322	+ .0527	+ .061
58		25	6.3	+ .112	= x	+ .2084	+ .0664	− .020
59		31	6.5	+ .188	= x	+ .2968	+ .0829	− .057
60	Feb.	5	6.0	+ .106	= x	+ .3675	+ .0938	+ .056
61		8	5.9	+0.062	= x	+0.4090	+0.1048	+0.118
62		17	17.1	+ .023	= x	+ .5310	+ .1306	+ .211
63		25	17.4	+ .097	= x	+ .6235	+ .1526	+ .178
64		26	16.9	+ .117	= x	+ .6341	+ .1553	+ .163
65		27	16.9	+ .320	= x	+ .6446	+ .1581	− .036
66	Mar.	12	16.1	+0.362	= x	+0.7624	+0.1935	−0.026
67		16	15.7	+ .299	= x	+ .7912	+ .2044	+ .050
68		23	16.4	+ .428	= x	+ .8326	+ .2236	− .061
69		27	14.8	+ .447	= x	+ .8508	+ .2344	− .072
70	Apr.	2	15.3	+ .313	= x	+ .8702	+ .2509	+ .071
71		16	14.4	+0.325	= x	+0.8801	+0.2891	+0.068
72		19	14.6	+ .276	= x	+ .8756	+ .2973	+ .117
73		20	15.0	+ .411	= x	+ .8736	+ .3000	− .025
74		25	13.4	+ .152	= x	+ .8600	+ .3137	+ .229
75		26	14.2	+ .273	= x	+ .8564	+ .3165	+ .106
76		29	13.8	+0.311	= x	+0.8445	+0.3246	+0.063
77		30	13.8	+ .422	= x	+ .8401	+ .3272	− .050
78	May	5	13.7	+ .262	= x	+ .8140	+ .3410	+ .098
79		7	13.0	+ .354	= x	+ .8021	+ .3465	+ .001
80		9	12.4	+ .446	= x	+ .7893	+ .3519	− .097
81		10	12.8	+0.394	= x	+0.7824	+0.3546	−0.048
82		13	13.0	+ .456	= x	+ .7604	+ .3628	− .120
83		14	12.8	+ .459	= x	+ .7529	+ .3655	− .126
84		16	12.8	+ .377	= x	+ .7369	+ .3710	− .051
85		18	12.8	+ .496	= x	+ .7199	+ .3765	+ .177
86		20	13.1	+0.407	= x	+0.7021	+0.3820	−0.096
87		26	13.2	+ .272	= x	+ .6442	+ .3984	+ .013
88		31	11.8	+ .256	= x	+ .5913	+ .4120	+ .006

The normal equations, after the ordinary treatment, become

$$\begin{aligned}
-\overset{\prime\prime}{1}.3140 &= +88.0000x - 6.7889\,d\mu - 2.5442\,\pi \\
+4.3827 &= -\ \ 6.7889 \quad + 8.4762 \quad + \ \ 9.7965 \\
+17.1716 &= -\ \ 2.5442 \quad + 9.7965 \quad + 38.7724
\end{aligned}$$

whence is derived by solution—

$$x = -0''.0016$$
$$d\mu = +0.0055$$
$$\pi = +0.4414$$

The probable error of π proves to be $\pm 0''.0222$, so that the value of the relative parallax from this star is

$$\pi = +0''.4414 \pm 0''.0222.$$

The probable error in one complete measure of distance is $\pm 0''.115$.

PARALLAX OF 61_2 *CYGNI AND STAR* (B).

The following set of tables are analogous to and in the same order of sequence as those already described in the three preceding cases, and hence call for no further remark.

TABLE X.

Concluded measures of 61_2 *Cygni from the comparison star* (b).

No. for Reference.	Date of Exposure of Plate. 1886.			Measured Distance of Star (*b*) to 61_2 Cygni.	Refraction Correction.	Aberration Correction.	Proper Motion.	Correction to Scale.	Concluded Distance of Star (*b*) from 61_2 Cygni.	Average Deviation.
		d.	h.	"	"	"	"	"	"	"
1	May	28	11.9	1022.078	+0.646	+0.063	+1.510	+0.118	1024.415	0.203
2		30	11.7	22.065	.798	.062	1.497	+ .138	24.560	.132
3	June	1	11.7	22.417	.646	.062	1.482	— .179	24.428	.137
4		4	11.8	22.733	.580	.062	1.462	— .127	24.710	.293
5		8	11.9	22.201	.522	.061	1.434	+ .416	24.634	.087
6		15	11.2	1022.519	+0.565	+0.059	+1.386	—0.183	1024.346	0.165
7		16	11.7	22.809	.479	.058	1.378	— .104	24.620	.193
8		23	11.6	22.053	.433	.056	1.330	+ .381	24.253	.242
9		24	11.6	22.733	.435	.055	1.323	— .319	24.227	.302
10		28	12.0	22.696	.372	.053	1.295	— .109	24.307	.085
11		30	11.4	1022.268	+0.408	+0.052	+1.282	+0.302	1024.312	0.225
12	July	1	11.3	22.476	.409	.051	1.275	+ .149	24.360	.138
13	Aug.	20	11.1	22.766	.289	.008	0.925	— .055	23.933	.243
14		24	9.8	22.428	.306	.004	0.900	+ .195	23.833	.262
15		26	9.3	22.574	.316	.002	0.887	+ .298	24.777	.113

No. for Reference.	Date of Exposure of Plate. 1886–7.			Measured Distance of Star (*b*) to 61_2 Cygni.	Refraction Correction.	Aberration Correction.	Proper Motion.	Correction to Scale.	Concluded Distance of Star (*b*) from 61_2 Cygni.	Average Deviation.
		d.	h.	"	"	"	"	"	"	"
16	Aug.	28	9.5	1022.839	+ 0.307	− 0.001	+ 0.873	+ 0.097	1024.115	0.270
17		29	9.5	23.179	.308	.002	.866	− .171	24.180	.126
18		30	8.9	22.960	.321	.003	.859	+ .042	24.179	.163
19		31	8.8	22.760	.321	.003	.852	+ .187	24.117	.192
20	Sept.	7	8.6	22.931	.313	.011	.804	− .046	23.991	.247
21		10	8.4	1022.525	+ 0.313	− 0.011	+ 0.783	+ 0.205	1023.815	0.103
22		11	8.5	23.089	.311	.015	.776	− .157	24.004	.244
23		13	8.4	23.235	.308	.017	.762	− .252	24.036	.225
24		15	8.1	23.262	.313	.019	.748	− .279	24.025	.293
25		16	9.8	22.598	.287	.019	.741	+ .334	23.941	.137
26		17	8.1	1023.267	+ 0.311	− 0.021	+ 0.735	− 0.225	1024.067	0.150
27		18	8.0	23.240	.310	.023	.728	− .176	24.079	.203
28		20	9.0	22.587	.290	.025	.712	+ .246	23.810	.072
29		22	9.4	23.145	.287	.027	.699	− .125	23.979	.146
30		27	10.2	23.053	.292	.031	.664	− .187	23.791	.285
31		29	8.6	1022.638	+ 0.288	− 0.033	+ 0.651	+ 0.242	1023.786	0.307
32		30	8.4	23.112	.289	.034	.643	+ .104	24.114	.322
33	Oct.	2	8.2	22.957	.290	.036	.630	− .003	23.838	.143
34		6	9.1	23.012	.288	.039	.603	+ .030	23.894	.205
35		13	10.1	23.007	.311	.045	.553	− .017	23.809	.069
36		21	7.5	1023.166	+ 0.287	− 0.050	+ 0.499	− 0.047	1023.855	0.143
37		22	7.5	23.057	.287	.051	.492	+ .096	23.881	.182
38	Nov.	3	6.6	23.372	.287	.057	.409	+ .010	24.021	.243
39		5	8.8	23.419	.311	.058	.394	− .062	24.004	.205
40		16	7.5	23.637	.301	.062	.318	− .181	24.013	.190
41		17	8.3	1023.291	+ 0.320	− 0.062	+ 0.311	+ 0.031	1023.891	0.311
42		18	8.6	22.427	.329	.063	.304	− .130	23.867	.227
43		23	8.6	23.619	.339	.063	.269	− .230	23.934	.086
44		29	6.9	23.353	.305	.063	.229	+ .017	23.841	.154
45	Dec.	1	7.3	23.401	.316	.063	.214	+ .060	23.928	.212
46		2	6.8	1023.585	+ 0.307	− 0.063	+ 0.208	− 0.048	1023.989	0.165
47		4	6.4	23.690	.301	.062	.194	− .174	23.949	.190
48		7	6.3	23.830	.305	.061	.187	− .200	24.061	.253
49		9	7.2	23.870	.329	.061	.159	− .203	24.094	.227
50		14	6.2	24.106	.311	.059	.124	− .492	23.990	.184
51		16	6.2	1024.268	+ 0.315	− 0.058	+ 0.111	− 0.583	1024.053	0.294
52		24	6.2	24.275	.328	.055	+ .056	− .520	24.084	.102
53	87 Jan.	5	6.9	24.375	.375	.048	− .030	− .699	23.973	.280
54		8	6.4	24.476	.364	.046	.050	− .434	24.310	.198
55		10	6.7	23.890	.381	.044	.064	+ .104	24.267	.219

No. for Reference.	Date of Exposure of Plate. 1887.			Measured Distance of Star (*b*) to 61_2 Cygni.	Refraction Correction.	Aberration Correction.	Proper Motion.	Correction to Scale.	Concluded Distance of Star (*b*) from 61_2 Cygni.	Average Deviation.
		d.	h.	"	"	"	"	"	"	"
56	Jan.	12	6.3	1024.845	+0.371	−0.042	−0.078	−0.696	1024.400	0.226
57		20	6.4	24.633	.394	.036	.133	− .566	24.292	.243
58		25	6.3	24.065	.402	.031	.168	+ .117	24.385	.175
59		31	6.5	24.731	.426	.025	.210	− .504	24.418	.292
60	Feb.	5	6.0	24.053	.419	.020	.238	+ .217	24.431	.205
61		8	5.9	1024.787	+0.425	−0.016	−0.266	−0.380	1024.550	0.183
62		17	17.1	24.065	1.116	− .006	.331	− .378	24.466	.169
63		25	17.4	24.164	0.798	+0.002	.386	+ .123	24.701	.272
64		26	16.9	24.315	.945	.003	.393	− .215	24.655	.240
65		27	16.9	23.571	.981	.004	.401	+ .447	24.602	.139
66	Mar.	12	16.1	1024.165	+0.910	+0.018	−0.490	+0.022	1024.625	0.087
67		16	15.7	24.607	0.945	.023	.517	− .275	24.783	.154
68		23	16.4	24.679	0.608	.030	.566	− .095	24.656	.227
69		27	14.8	24.158	1.035	.033	.594	+ .189	24.821	.275
70	Apr.	2	15.3	24.371	0.713	.038	.635	+ .210	24.697	.165
71		16	14.4	1024.038	+0.712	+0.049	−0.732	+0.572	1024.639	0.273
72		19	14.6	25.126	.617	.051	.753	− .281	24.760	.207
73		20	15.0	24.598	.544	.051	.760	+ .228	24.661	.145
74		25	13.4	24.782	.835	.054	.794	− .147	24.730	.209
75		26	14.2	24.862	.608	.055	.801	− .049	24.675	.163
76		29	13.8	1024.744	+0.664	+0.057	−0.822	−0.011	1024.632	0.190
77		30	13.8	24.893	.637	.057	.829	+ .004	24.762	.139
78	May	5	13.7	25.063	.596	.060	.864	− .227	24.628	.244
79		7	13.0	24.852	.713	.060	.877	− .138	24.610	.292
80		9	12.4	24.652	.875	.060	.891	− .039	24.657	.087
81		10	12.8	1024.936	+0.721	+0.061	−0.899	−0.206	1024.613	0.305
82		13	13.0	25.215	.623	.061	.919	− .411	24.569	.242
83		14	12.8	25.292	.664	.061	.926	− .381	24.710	.129
84		16	12.8	25.304	.631	.062	.940	− .368	24.689	.290
85		18	12.8	25.122	.599	.062	.953	− .209	24.621	.163
86		20	13.1	1025.310	+0.522	+0.062	−0.968	−0.203	1024.723	0.207
87		26	13.2	25.023	.465	.063	1.009	+ .011	24.553	.153
88		31	11.8	24.711	.706	.062	1.044	+ .104	24.539	.198

TABLE XI.

Equations of Condition formed from the measures of 61_2 Cygni and Star (b).

No.	Date, 1886.			Equations of Condition.	Residual.
		d.	h.	$''$	$''$
1	May	28	11.9	$+0.115 = x + 0.6226\ \pi - 0.5961\ d\mu$	+0.140
2		30	11.7	$+\ .260 = x + .6024 - .5908$	+ .013
3	June	1	11.7	$+\ .128 = x + .5812 - .5853$	+ .109
4		4	11.8	$+\ .410 = x + .5514 - .5771$	− .185
5		8	11.9	$+\ .334 = x + .4972 - .5660$	− .114
6		15	11.2	$+0.046 = x + 0.4079 - 0.5469$	+0.115
7		16	11.7	$+\ .320 = x + .3963 - .5442$	− .164
8		23	11.6	$-\ .047 = x + .2987 - .5250$	+ .160
9		24	11.6	$-\ .073 = x + .2847 - .5223$	+ .170
10		28	12.0	$+\ .007 = x + .2274 - .5114$	+ .073
11		30	11.4	$+0.012 = x + 0.1985 - 0.5059$	+0.056
12	July	1	11.3	$+\ .060 = x + .1840 - .5031$	− .002
13	Aug.	20	11.1	$-\ .367 = x - .5227 - .3653$	+ .115
14		24	9.8	$-\ .467 = x - .5686 - .3556$	+ .195
15		26	9.3	$-\ .223 = x - .5910 - .3501$	− .059
16		28	9.5	$-0.185 = x - 0.6128 - 0.3445$	−0.106
17		29	9.5	$-\ .120 = x - .6239 - .3418$	− .176
18		30	8.9	$-\ .121 = x - .6335 - .3392$	− .179
19		31	8.8	$-\ .183 = x - .6438 - .3364$	− .122
20	Sept.	7	8.6	$-\ .309 = x - .7105 - .3174$	− .025
21		10	8.4	$-0.485 = x - 0.7361 - 0.3091$	+0.138
22		11	8.5	$-\ .296 = x - .7439 - .3064$	− .053
23		13	8.4	$-\ .264 = x - .7595 - .3009$	− .092
24		15	8.1	$-\ .275 = x - .7737 - .2955$	− .087
25		16	9.8	$-\ .359 = x - .7813 - .2925$	− .106
26		17	8.1	$-0.233 = x - 0.7881 - 0.2900$	−0.135
27		18	8.0	$-\ .221 = x - .7941 - .2872$	− .150
28		20	9.0	$-\ .490 = x - .8070 - .2815$	+ .114
29		22	9.4	$-\ .321 = x - .8180 - .2761$	− .060
30		27	10.2	$-\ .509 = x - .8425 - .2623$	+ .117
31		29	8.6	$-0.514 = x - 0.8503 - 0.2570$	+0.120
32		30	8.4	$-\ .186 = x - .8539 - .2543$	− .210
33	Oct.	2	8.2	$-\ .462 = x - .8602 - .2488$	+ .063
34		6	9.1	$-\ .406 = x - .8701 - .2380$	+ .003
35		13	10.1	$-\ .491 = x - .8773 - .2185$	+ .085

No.	Date, 1886–7.	d.	h.	Equations of Condition.				Residual.
		d.	h.	"				"
36	Oct.	21	7.5	−0.445	= x	−0.8700 π	−0.1969 $d\mu$	+0.044
37		22	7.5	− .419	= x	− .8680	− .1942	+ .019
38	Nov.	3	6.6	− .279	= x	− .8220	− .1615	− .099
39		5	8.8	− .296	= x	− .8111	− .1557	− .077
40		16	7.5	− .287	= x	− .7331	− .1257	− .049
41		17	8.3	−0.409	= x	−0.7244	−0.1229	+0.076
42		18	8.6	− .433	= x	− .7156	− .1201	+ .104
43		23	8.6	− .366	= x	− .6686	− .1064	+ .059
44		29	6.9	− .459	= x	− .6060	− .0904	+ .181
45	Dec.	1	7.3	− .372	= x	− .5832	− .0847	+ .105
46		2	6.8	−0.311	= x	−0.5722	−0.0820	+0.049
47		4	6.4	− .351	= x	− .5487	− .0766	+ .099
48		7	6.3	− .239	= x	− .5122	− .0739	+ .004
49		9	7.2	− .206	= x	− .4863	− .0628	− .016
50		14	6.2	− .310	= x	− .4211	− .0492	+ .126
51		16	6.2	−0.247	= x	−0.3941	−0.0438	+0.066
52		24	6.2	− .216	= x	− .2807	− .0219	+ .087
53	87 Jan.	5	6.9	− .327	= x	− .1002	+ .0118	+ .281
54		8	6.4	+ .010	= x	− .0546	+ .0198	− .035
55		10	6.7	− .033	= x	− .0237	+ .0253	+ .022
56		12	6.3	+0.100	= x	+0.0068	+0.0308	−0.097
57		20	6.4	− .008	= x	+ .1296	+ .0527	+ .067
58		25	6.3	+ .085	= x	+ .2058	+ .0664	+ .010
59		31	6.5	+ .118	= x	+ .2944	+ .0829	+ .017
60	Feb.	5	6.0	+ .131	= x	+ .3649	+ .0938	+ .037
61		8	5.9	+0.250	= x	+0.4067	+0.1048	−0.063
62		17	17.1	+ .166	= x	+ .5291	+ .1306	+ .077
63		25	17.4	+ .401	= x	+ .6219	+ .1526	− .115
64		26	16.9	+ .355	= x	+ .6325	+ .1553	− .065
65		27	16.9	+ .302	= x	+ .6430	+ .1581	− .007
66	Mar.	12	16.1	+0.325	= x	+0.7614	+0.1935	+0.025
67		16	15.7	+ .483	= x	+ .7904	+ .2044	− .080
68		23	16.4	+ .356	= x	+ .8322	+ .2236	+ .027
69		27	14.8	+ .521	= x	+ .8504	+ .2344	− .129
70	Apr.	2	15.3	+ .397	= x	+ .8702	+ .2509	+ .004
71		16	14.4	+0.339	= x	+0.8808	+0.2891	+0.068
72		19	14.6	+ .460	= x	+ .8765	+ .2973	− .053
73		20	15.0	+ .361	= x	+ .8745	+ .3000	+ .044
74		25	13.4	+ .430	= x	+ .8612	+ .3137	− .031
75		26	14.2	+ .375	= x	+ .8576	+ .3165	+ .023

No.	Date, 1887.	Equations of Condition.	Residual.
	d. h.	″	″
76	Apr. 29 13.8	$+0.332 = x + 0.8458\,\pi + 0.3246\,d\mu$	+0.060
77	30 13.8	$+ .462 = x + .8414 + .3272$	− .071
78	May 5 13.7	$+ .328 = x + .8155 + .3410$	+ .052
79	7 13.0	$+ .310 = x + .8038 + .3465$	+ .065
80	9 12.4	$+ .357 = x + .7910 + .3519$	+ .013
81	10 12.8	$+0.313 = x + 0.7842 + 0.3546$	+0.054
82	13 13.0	$+ .269 = x + .7623 + .3628$	+ .088
83	14 12.8	$+ .410 = x + .7548 + .3655$	− .055
84	16 12.8	$+ .389 = x + .7389 + .3710$	− .042
85	18 12.8	$+ .321 = x + .7220 + .3765$	+ .019
86	20 13.1	$+0.423 = x + 0.7042 + 0.3820$	−0.091
87	26 13.2	$+ .253 = x + .6465 + .3984$	+ .054
88	31 11.8	$+ .239 = x + .5938 + .4120$	+ .044

The normal equations in this case are—

$$\begin{aligned} -\overset{\prime\prime}{1.534} &= +88.0000x - 6.7889\,d\mu - 2.5463\pi \\ +4.7542 &= -\ \ 6.7889 \quad +8.4762 \quad +\ \ 9.7649 \\ +17.9295 &= -\ \ 2.5463 \quad +9.7649 \quad +38.8860 \end{aligned}$$

whence is derived by solution—

$$x = -0\overset{\prime\prime}{.}0012$$
$$d\mu = +0.0406$$
$$\pi = +0.4508.$$

The probable error of π proves to be $0''.0191$, so that the value of the relative parallax from this star is—

$$\pi = +0''.4508 \pm 0''.0191.$$

The probable error of a complete measure of distance is $\pm 0''.100$.

In the adjoining Table are exhibited the differences in the measured distances of the star (*b*) from each of the components of 61 Cygni. The mean difference is $20''.594$.

TABLE XII.

Differences of the measured distances of Star (b) *from* 61_1 *and* 61_2 *Cygni.*

No.	Difference of Measure.	Difference from Mean.	No.	Difference of Measure.	Difference from Mean.	No.	Difference of Measure.	Difference from Mean.
	"	"		"	"		"	"
1	20.525	0.069	31	20.528	0.066	61	20.788	0.194
2	.757	.163	32	.616	.022	62	.743	.149
3	.493	.101	33	.442	.152	63	.904	.310
4	.600	.006	34	.663	.069	64	.838	.244
5	.513	.081	35	.414	.180	65	.582	.012
6	20.260	0.334	36	20.419	0.175	66	20.563	0.031
7	.528	.066	37	.495	.099	67	.784	.190
8	.561	.033	38	.594	.000	68	.528	.066
9	.547	.047	39	.668	.074	69	.674	.080
10	.544	.050	40	.741	.147	70	.684	.090
11	20.679	0.085	41	20.458	0.136	71	20.614	0.020
12	.555	.039	42	.596	.002	72	.790	.196
13	.593	.001	43	.496	.098	73	.550	.044
14	.513	.081	44	.531	.063	74	.878	.284
15	.692	.098	45	.667	.073	75	.702	.108
16	20.422	0.172	46	20.535	0.059	76	20.521	0.073
17	.742	.148	47	.595	.001	77	.640	.046
18	.718	.124	48	.576	.018	78	.666	.072
19	.623	.019	49	.634	.040	79	.556	.038
20	.671	.077	50	.369	.225	80	.511	.083
21	20.497	0.097	51	20.338	0.256	81	20.519	0.075
22	.775	.181	52	.561	.033	82	.413	.181
23	.818	.224	53	.234	.360	83	.551	.043
24	.746	.152	54	.616	.022	84	.612	.018
25	.724	.130	55	.714	.120	85	.425	.169
26	20.657	0.063	56	20.551	0.043	86	20.616	0.022
27	.761	.167	57	.595	.001	87	.581	.013
28	.496	.098	58	.573	.021	88	.583	.011
29	.645	.051	59	.530	.064			
30	.522	.072	60	.625	.031			

PARALLAX OF 61_1 *CYGNI AND STAR* (C).

Having regard to the importance of establishing, on what I hope are incontrovertible grounds, the accuracy of the photographic method, I have thought it prudent to proceed a step further in the enquiry, and as is not unusual in parallax researches, I determined to continue the enquiry with reference to another pair of comparison stars situated at a very considerable angle to the direction of the former diagonal. In adopting this course I had also at the time another thought in my mind, viz. that by selecting many stars of comparison I might derive an approximate value of the absolute parallax itself. It is already hinted in the Introduction, § III, that similarity of magnitude is very far from being attended by similarity of parallax, at all events it certainly is not so in individual cases.

The additional pair of stars selected is D.M. + 37°, No. 4175 and D.M. + 38°, No. 4348, of the magnitudes 9·0 and 9·5 respectively. Of course the diagonal of reference is now different from that employed in the other determinations; and, before proceeding to the Tables involving the parallactic processes, it will be interesting to compare the variations of these measurements conducted along two directions on the film nearly at right angles to each other. Inasmuch as these diagonals of reference are of somewhat different length, viz. (*a*) to (*b*) 2380″ and (*c*) to (*d*) 2066″, the variations are, for the purpose of this comparison, taken proportionally for 1000″ in each direction.

TABLE XIII.

Comparison of the measures of the two diagonals approximately at Right Angles.

Variation in 1000″ from an Adopted Mean.

Date, 1886.	Variation in measure of *a* to *b*.	Variation in measure of *c* to *d*.	Date, 1886.	Variation in measure of *a* to *b*.	Variation in measure of *c* to *d*.	Date, 1886.	Variation in measure of *a* to *b*.	Variation in measure of *c* to *d*.
	″	″		″	″		″	″
May 28	+ 0.116	...	Aug. 20	− 0.053	− 0.019	Sept. 16	+ 0.326	+ 0.160
30	+ .135	− 0.171	24	+ .191	+ .142	17	− .220	− .179
June 1	− .175	− .273	26	+ .291	+ .415	18	− .172	− .262
4	− .126	+ .180	28	+ .095	− .179	20	+ .240	+ .184
8	+ .406	+ .223	29	− .167	− .207	22	− .122	− .292
15	− .179	+ .155	30	+ .041	− .038	27	− .183	− .281
16	− .102	− .315	31	+ .183	+ .169	29	+ .236	+ .157
23	+ .372	− .220	Sept. 7	− .045	+ .238	30	+ .102	− .176
24	− .312	− .581	10	+ .200	+ .042	Oct. 2	− .003	+ .070
28	− .106	− .046	11	− .154	− .080	6	+ .029	+ .109
30	+ .295	− .296	13	− .246	− .013	13	− .017	− .013
July 1	+ .145	+ .316	15	− .272	− .161	21	− .046	+ .004

Date, 1886.	Variation in measure of a to b.	Variation in measure of c to d.	Date, 1887.	Variation in measure of a to b.	Variation in measure of c to d.	Date, 1887.	Variation in measure of a to b.	Variation in measure of c to d.
	″	″		″	″		″	″
Oct. 22	+ 0.094	+ 0.058	Jan. 5	− 0.682	− 0.592	Apr. 16	+ 0.558	+ 0.156
Nov. 3	+ .010	+ .044	8	− .424	− .312	19	− .274	+ .016
5	− .061	− .148	10	+ .101	+ .092	20	+ .223	+ .449
16	− .177	− .004	12	− .680	− .542	25	− .144	− .047
17	+ .031	− .035	20	− .553	− .509	26	− .048	+ .035
18	− .127	− .155	25	+ .114	+ .136	29	− .011	+ .061
23	− .225	− .025	31	− .492	− .398	30	+ .004	+ .011
29	+ .016	− .002	Feb. 5	+ .212	+ .312	May 5	− .222	− .227
Dec. 1	+ .059	+ .063	8	− .371	− .442	7	− .134	− .181
2	− .047	+ .003	17	− .369	− .302	9	− .038	− .040
4	− .170	+ .063	25	+ .120	+ .066	10	− .202	− .273
7	− .196	− .148	26	− .210	− .150	13	− .401	− .336
9	− .199	− .052	27	+ .436	+ .303	14	− .372	− .196
14	− .476	− .398	Mar. 12	+ .021	+ .118	16	− .360	− .031
16	− .570	− .198	16	− .269	− .256	18	− .205	− .186
24	− .508	− .136	23	− .093	+ .123	20	− .198	+ .079
			27	+ .184	+ .155	26	+ .011	+ .109
			Apr. 2	+ .205	+ .170	31	+ .102	+ .150

The inspection of the Table suggests, I think, that the principal cause of the variations in question lies not so much in accidental or local variations of the film as in actual variations in the focal length of the mirror. This suggestion seems to me to be borne out by the general prevalence of the same sign being attached to the variations on the same night.

Having premised thus much, I proceed to give the following sets of Tables for the determination of the parallax of the two components with regard to the two comparison stars, and these Tables will not require any further comment.

The expressions for the computation of the parallactic factors with regard to these two stars are for

D.M. +37°, No. 4175.

61_1 Cygni. $R\,[9.92281]\cos(\odot - 121^\circ\ 29')\,\pi.$

61_2 Cygni. $R\,[9.92247]\cos(\odot - 120^\circ\ 23')\,\pi.$

D.M. +38°, No. 4348.

61_1 Cygni. $R\,[9.93706]\cos(\odot - 292^\circ\ 46')\,\pi.$

61_2 Cygni. $R\,[9.93539]\cos(\odot - 293^\circ\ 56')\,\pi.$

TABLE XIV.

Measures of the distance of Star (c) *from Star* (d), *for the determination, at the times of exposure, of the correction to their measured distances from* 61_1 *and* 61_2 *Cygni.*

No. for Reference.	Date of Exposure of Plate. 1886.	Measured Distance of *c* to *d* in Arc.	Average Deviation from the Mean.	Refraction.	Aberration.	Corrected Distance of *c* to *d*.	Difference from Assumed Mean.
	d. h.	"	"	"	"	"	"
1	May 30 11.7	2065.420	0.305	+0.967	+0.126	2066.513	−0.353
2	June 1 11.7	65.779	.211	.819	.126	66.724	− .564
3	4 11.8	64.898	.243	.766	.124	65.788	+ .372
4	8 11.9	64.855	.092	.722	.123	65.700	+ .460
5	15 11.2	64.967	.136	.753	.119	65.839	+ .321
6	16 11.7	2065.990	0.274	+0.701	+0.119	2066.810	−0.650
7	23 11.6	65.837	.381	.665	.113	66.615	−0.455
8	24 11.6	66.579	.115	.669	.111	67.359	+1.199
9	28 12.0	65.514	...	.635	.107	66.256	+0.096
10	30 11.4	66.014	.144	.653	.105	66.772	+0.612
11	July 1 11.3	2064.753	0.202	+0.650	+0.104	2065.507	+0.653
12	Aug. 20 11.1	65.573	.150	.611	.016	66.200	− .040
13	24 9.8	65.247	.309	.612	.008	65.867	+ .293
14	26 9.3	64.685	.371	.615	+ .003	65.303	+ .857
15	28 9.5	65.918	.244	.613	− .001	66.530	− .370
16	29 9.5	2065.978	0.262	+0.612	−0.003	2066.587	−0.427
17	30 8.9	65.627	.203	.616	.005	66.238	− .078
18	31 8.8	65.202	.135	.615	.007	65.810	+ .350
19	Sept. 7 8.6	65.077	.129	.614	.022	65.669	+ .491
20	10 8.4	65.482	.322	.614	.023	66.073	+ .087
21	11 8.5	2065.743	0.274	+0.613	−0.031	2066.325	−0.165
22	13 8.4	65.609	.289	.612	.035	66.186	− .026
23	15 8.1	65.918	.096	.614	.039	66.493	− .333
24	16 9.8	65.253	.145	.616	.040	65.829	+ .331
25	17 8.1	65.958	.273	.613	.042	66.529	− .369
26	18 8.0	2066.134	0.304	+0.613	−0.045	2066.702	−0.542
27	20 9.0	65.218	.135	.611	.049	65.780	+ .380
28	22 9.4	66.201	.211	.616	.053	66.764	− .604
29	27 10.2	66.166	.193	.638	.063	66.741	− .581
30	29 8.6	65.290	.244	.612	.066	65.836	+ .324
31	30 8.4	2065.980	0.309	+0.611	−0.068	2066.523	−0.363
32	Oct. 2 8.2	65.477	.242	.611	.072	66.016	+ .144
33	6 9.1	65.389	.097	.624	.079	65.934	+ .226
34	13 10.1	65.583	.149	.693	.090	66.186	− .026
35	21 7.5	65.638	.216	.616	.102	66.152	+ .008

No. for Reference.	Date of Exposure of Plate. 1886–7.			Measured Distance of c to d in Arc.	Average Deviation from the Mean.	Refraction.	Aberration.	Corrected Distance of c to d.	Difference from Assumed Mean.
		d.	h.	″	″	″	″	″	″
36	Oct.	22	7.5	2065.526	0.242	+0.617	−0.103	2066.040	+0.120
37	Nov.	3	6.6	65.570	.315	.616	.116	66.070	+ .090
38		5	8.8	65.891	.250	.692	.118	66.465	− .305
39		16	7.5	65.630	.072	.664	.125	66.169	− .009
40		17	8.3	65.635	.131	.722	.125	66.232	− .072
41		18	8.6	2065.846	0.193	+0.759	−0.125	2066.480	−0.320
42		23	8.6	65.535	.250	.803	.126	66.212	− .052
43		29	6.9	65.616	.183	.674	.126	66.164	− .004
44	Dec.	1	7.3	65.447	.191	.709	.126	66.030	+ .130
45		2	6.8	65.604	.079	.676	.126	66.154	+ .006
46		4	6.4	2065.491	0.363	+0.665	−0.126	2066.030	+0.130
47		7	6.3	65.917	.324	.673	.125	66.465	− .305
48		9	7.2	65.631	.167	.760	.123	66.268	− .108
49		14	6.2	66.412	.153	.691	.120	66.983	− .823
50		16	6.2	65.979	.209	.710	.119	66.570	− .410
51		24	6.2	2065.797	0.183	+0.757	−0.112	2066.442	−0.282
52	87 Jan.	5	6.9	66.396	.274	1.085	.097	67.384	−1.224
53		8	6.4	65.944	.246	0.953	.092	66.805	−0.645
54		10	6.7	64.908	.309	1.150	.089	65.969	+0.191
55		12	6.3	66.330	.362	1.033	.086	67.277	−1.117
56		20	6.4	2065.960	0.244	+1.324	−0.072	2067.212	−1.052
57		25	6.3	64.523	.173	1.417	.062	65.878	+0.282
58		31	6.5	65.046	.209	1.987	.050	66.983	−0.823
59	Feb.	5	6.0	63.810	.132	1.747	.042	65.515	+0.645
60		8	5.9	65.193	.347	1.913	.033	67.073	−0.913
61		17	17.1	2065.461	0.262	+1.335	−0.012	2066.784	−0.624
62		25	17.4	65.051	.385	0.969	+0.004	66.024	+ .136
63		26	16.9	65.329	.153	1.133	.007	66.469	− .309
64		27	16.9	64.349	.174	1.175	.009	65.533	+ .627
65	Mar.	12	16.1	64.791	.209	1.089	.037	65.917	+ .243
66		16	15.7	2065.517	0.342	+1.127	+0.045	2066.689	−0.529
67		23	16.4	65.061	.173	0.786	.059	65.906	+ .254
68		27	14.8	64.532	.207	1.240	.067	65.839	+ .321
69	Apr.	2	15.3	64.849	.292	0.881	.078	65.808	+ .352
70		16	14.4	64.855	.036	0.884	.099	65.838	+ .322
71		19	14.6	2065.238	0.069	+0.786	+0.103	2066.127	+0.033
72		20	15.0	64.397	.143	0.732	.104	65.233	+ .927
73		25	13.4	65.142	.272	1.005	.110	66.257	− .097
74		26	14.2	65.191	.135	0.786	.111	66.088	+ .072
75		29	13.8	65.105	.350	0.814	.114	66.033	+ .127

No. for Reference.	Date of Exposure of Plate. 1887.			Measured Distance of *c* to *d* in Arc.	Average Deviation from the Mean.	Refraction.	Aberration.	Corrected Distance of *c* to *d.*	Difference from Assumed Mean.
		d.	h.	"	"	"	"	"	"
76	Apr.	30	13.8	2065.209	0.207	+0.814	+0.115	2066.138	+0.022
77	May	5	13.7	65.747	.160	0.763	.119	66.629	— .469
78		7	13.0	65.531	.093	0.881	.121	66.533	— .373
79		9	12.4	65.078	.282	1.042	.122	66.242	— .082
80		10	12.8	65.715	.145	0.887	.122	66.724	— .564
81		13	13.0	2065.937	0.322	+0.793	+0.124	2066.854	—0.694
82		14	12.8	65.605	.144	.836	.124	66.565	— .405
83		16	12.8	65.291	.274	.809	.125	66.225	— .065
84		18	12.8	65.635	.365	.784	.125	66.544	— .384
85		20	13.1	65.148	.253	.722	.126	65.996	+ .164
86		26	13.2	2065.125	0.382	+0.683	+0.127	2065.935	+0.225
87		31	11.8	64.919	.179	.807	.125	65.851	+ .309

TABLE XV.

Concluded measures of 61_1 Cygni from the comparison Star (c).

No. for Reference.	Date of Exposure of Plate. 1886.			Measured Distance of Star (*c*) to 61_1 Cygni.	Refraction Correction.	Aberration Correction.	Proper Motion.	Correction to Scale.	Concluded Distance of Star (*c*) from 61_1 Cygni.	Average Deviation.
		d.	h.	"	"	"	"	"	"	"
1	May	30	11.7	1115.467	+0.593	+0.072	+1.910	—0.191	1117.851	0.203
2	June	1	11.7	15.839	.491	.072	1.895	— .305	17.992	.135
3		4	11.8	15.427	.451	.071	1.866	+ .201	18.016	.139
4		8	11.9	15.431	.420	.070	1.830	+ .249	18.000	.296
5		15	11.2	15.564	.444	.068	1.768	+ .174	18.018	.087
6		16	11.7	1116.310	+0.399	+0.068	+1.760	—0.352	1118.185	0.243
7		23	11.6	16.345	.379	.064	1.698	— .246	18.240	.113
8		24	11.6	16.584	.380	.064	1.689	— .649	18.068	.295
9		30	11.4	16.349	.368	.061	1.636	— .331	18.083	.187
10	July	1	11.3	15.848	.370	.059	1.627	+ .353	18.257	.220
11	Aug.	20	11.1	1116.588	+0.332	+0.009	+1.181	—0.022	1118.088	0.164
12		24	9.8	16.383	.334	+ .004	1.150	+ .159	18.030	.244
13		26	9.3	16.158	.337	+ .002	1.132	+ .464	18.093	.311
14		28	9.5	16.820	.334	— .000	1.114	— .200	18.068	.246
15		29	9.5	16.824	.335	— .002	1.105	— .231	18.031	.087

No. for Reference.	Date of Exposure of Plate. 1886–7.			Measured Distance of Star (*c*) to 61_1 Cygni.	Refraction Correction.	Aberration Correction.	Proper Motion.	Correction to Scale.	Concluded Distance of Star (*c*) from 61_1 Cygni.	Average Deviation.
		d.	h.	″	″	″	″	″	″	″
16	Aug.	30	8.9	1116.645	+0.338	−0.003	+1.097	−0.042	1118.035	0.162
17		31	8.8	16.612	.338	.004	1.088	+ .189	18.223	.207
18	Sept.	7	8.6	16.373	.336	.013	1.026	+ .266	17.988	.138
19		10	8.4	16.541	.336	.013	1.000	+ .047	17.911	.192
20		11	8.5	16.971	.335	.017	0.991	− .089	18.191	.255
21		13	8.4	1117.023	+0.335	−0.020	+0.973	−0.014	1118.297	0.203
22		15	8.1	16.918	.336	.022	.956	− .180	18.004	.172
23		16	9.8	16.803	.332	.023	.946	+ .179	18.237	.154
24		17	8.1	17.164	.335	.024	.938	− .200	18.213	.086
25		18	8.0	17.064	.334	.026	.929	− .293	18.008	.305
26		20	9.0	1116.470	+0.332	−0.028	+0.909	+0.206	1117.889	0.260
27		22	9.4	17.081	.332	.030	.893	− .327	17.949	.144
28		27	10.2	17.167	.339	.036	.848	− .314	18.004	.205
29		29	8.6	16.789	.332	.038	.831	+ .175	18.089	.133
30		30	8.4	17.106	.332	.039	.822	− .196	18.025	.279
31	Oct.	2	8.2	1116.619	+0.332	−0.041	+0.804	+0.078	1117.792	0.227
32		6	9.1	16.787	.335	.045	.770	+ .122	17.969	.145
33		13	10.1	16.835	.361	.051	.707	− .014	17.838	.208
34		21	7.5	16.831	.332	.058	.636	+ .004	17.745	.162
35		22	7.5	16.768	.332	.059	.627	+ .065	17.733	.156
36	Nov.	3	6.6	1116.847	+0.332	−0.066	+0.522	+0.049	1117.684	0.097
37		5	8.8	17.013	.361	.067	.503	− .165	17.645	.222
38		16	7.5	16.962	.349	.071	.406	− .005	17.641	.265
39		17	8.3	16.970	.372	.071	.398	− .039	17.630	.143
40		18	8.6	17.047	.388	.071	.388	− .173	17.579	.182
41		23	8.6	1116.982	+0.409	−0.072	+0.344	−0.028	1117.635	0.229
42		29	6.9	16.926	.354	.072	.292	− .002	17.498	.073
43	Dec.	1	7.3	16.809	.368	.072	.274	+ .070	17.449	.135
44		2	6.8	16.955	.354	.072	.265	+ .003	17.505	.208
45		4	6.4	16.941	.349	.071	.248	+ .070	17.537	.148
46		7	6.3	1117.215	+0.353	−0.071	+0.239	−0.165	1117.571	0.206
47		9	7.2	16.794	.386	.070	.203	− .058	17.255	.083
48		14	6.2	17.377	.361	.069	.159	− .445	17.383	.132
49		16	6.2	17.145	.367	.068	.142	− .221	17.365	.197
50		24	6.2	17.215	.386	.064	.074	− .153	17.458	.250
51	87 Jan.	5	6.9	1117.706	+0.522	−0.055	−0.038	−0.662	1117.473	0.206
52		8	6.4	17.350	.474	.053	.064	− .349	17.358	.313
53		10	6.7	16.911	.545	.051	.082	+ .103	17.426	.087
54		12	6.3	17.707	.492	.049	.100	− .604	17.446	.142
55		20	6.4	17.386	.621	.041	.170	− .569	17.227	.205

No. for Reference.	Date of Exposure of Plate. 1887.			Measured Distance of Star (*c*) to 61_1 Cygni.	Refraction Correction.	Aberration Correction.	Proper Motion.	Correction to Scale.	Concluded Distance of Star (*c*) from 61_1 Cygni.	Av rage Deviation.
		d.	h.	"	"	"	"	"	"	"
56	Jan.	25	6.3	1116.805	+0.676	−0.036	−0.215	+0.153	1117.383	0.262
57		31	6.5	17.301	.938	.029	.268	− .445	17.497	.139
58	Feb.	5	6.0	16.531	.821	.024	.303	+ .349	17.374	.240
59		8	5.9	17.436	.913	.019	.339	− .494	17.497	.135
60		17	17.1	17.426	.847	− .007	.423	− .338	17.505	.207
61		25	17.4	1117.266	+0.593	+0.002	−0.493	+0.074	1117.442	0.180
62		26	16.9	17.453	.705	.004	.502	− .167	17.493	.211
63		27	16.9	17.005	.734	.005	.511	+ .339	17.572	.133
64	Mar.	12	16.1	17.494	.677	.021	.625	+ .131	17.698	.292
65		16	15.7	17.760	.705	.026	.660	− .286	17.545	.241
66		23	16.4	1117.706	+0.467	+0.034	−0.723	+0.137	1117.621	0.262
67		27	14.8	17.300	.780	.038	.758	+ .174	17.534	.125
68	Apr.	2	15.3	17.670	.533	.044	.811	+ .190	17.626	.270
69		16	14.4	17.867	.535	.057	.935	+ .174	17.698	.139
70		19	14.6	18.308	.472	.058	.961	+ .018	17.895	.244
71		20	15.0	1117.618	+0.432	+0.059	−0.970	+0.502	1117.641	0.260
72		25	13.4	18.046	.621	.063	1.014	− .052	17.666	.139
73		26	14.2	18.172	.467	.063	1.023	+ .039	17.718	.204
74		29	13.8	18.109	.502	.065	1.049	+ .069	17.696	.083
75		30	13.8	18.427	.486	.065	1.058	+ .012	17.932	.111
76	May	5	13.7	1118.637	+0.460	+0.068	−1.103	−0.254	1117.808	0.293
77		7	13.0	18.640	.533	.069	1.120	− .202	17.920	.145
78		9	12.4	18.180	.648	.069	1.138	− .044	17.715	.207
79		10	12.8	18.666	.538	.070	1.147	− .305	17.822	.132
80		13	13.0	18.691	.477	.070	1.173	− .375	17.690	.190
81		14	12.8	1118.594	+0.502	+0.071	−1.182	−0.219	1117.766	0.222
82		16	12.8	18.472	.481	.071	1.200	− .035	17.789	.147
83		18	12.8	18.603	.457	.071	1.218	− .208	17.705	.169
84		20	13.1	18.548	.420	.072	1.236	+ .089	17.893	.257
85		26	13.2	18.606	.396	.072	1.289	+ .122	17.907	.083
86		31	11.8	1118.535	+0.481	+0.071	−1.332	+0.167	1117.922	0.215

TABLE XVI.

Equations of Condition formed from the measures of 61_1 *Cygni and Star* (c).

No.	Date, 1886.			Equations of Condition.	Residual.
		d.	h.	″	″
1	May	30	11.7	$+0.151 = x + 0.5177\,\pi - 0.5908\,d\mu$	+0.227
2	June	1	11.7	$+.292 = x + .5401 - .5853$	+.095
3		4	11.8	$+.316 = x + .5726 - .5771$	+.085
4		8	11.9	$+.300 = x + .6134 - .5660$	+.117
5		15	11.2	$+.318 = x + .6776 - .5469$	+.125
6		16	11.7	$+0.485 = x + 0.6864 - 0.5442$	−0.038
7		23	11.6	$+.540 = x + .7404 - .5250$	−.073
8		24	11.6	$+.368 = x + .7474 - .5223$	−.102
9		30	11.4	$+.383 = x + .7841 - .5059$	−.101
10	July	1	11.3	$+.557 = x + .7894 - .5031$	−.072
11	Aug.	20	11.1	$+0.388 = x + 0.7601 - 0.3653$	+0.063
12		24	9.8	$+.330 = x + .7332 - .3556$	+.108
13		26	9.3	$+.393 = x + .7184 - .3501$	+.038
14		28	9.5	$+.368 = x + .7026 - .3445$	+.055
15		29	9.5	$+.331 = x + .6945 - .3418$	+.088
16		30	8.9	$+0.335 = x + 0.6866 - 0.3392$	+0.081
17		31	8.8	$+.523 = x + .6780 - .3364$	−.112
18	Sept.	7	8.6	$+.288 = x + .6128 - .3174$	+.091
19		10	8.4	$+.211 = x + .5819 - .3091$	+.153
20		11	8.5	$+.491 = x + .5716 - .3064$	−.132
21		13	8.4	$+0.597 = x + 0.5500 - 0.3009$	−0.248
22		15	8.1	$+.304 = x + .5279 - .2955$	+.034
23		16	9.8	$+.537 = x + .5159 - .2925$	−.205
24		17	8.1	$+.513 = x + .5041 - .2900$	−.187
25		18	8.0	$+.308 = x + .4933 - .2872$	+.014
26		20	9.0	$+0.189 = x + 0.4686 - 0.2815$	+0.121
27		22	9.4	$+.249 = x + .4450 - .2761$	+.049
28		27	10.2	$+.304 = x + .3817 - .2623$	−.036
29		29	8.6	$+.389 = x + .3562 - .2570$	−.133
30		30	8.4	$+.325 = x + .3430 - .2543$	−.075
31	Oct.	2	8.2	$+0.092 = x + 0.3165 - 0.2488$	+0.145
32		6	9.1	$+.269 = x + .2623 - .2380$	−.058
33		13	10.1	$+.138 = x + .1631 - .2185$	+.026
34		21	7.5	$+.045 = x + .0501 - .1969$	+.065
35		22	7.5	$+.033 = x + .0355 - .1942$	+.070

No.	Date, 1886-7.			Equations of Condition.				Residual.
		d.	h.	″				″
36	Nov.	3	6.6	−0.016	= x	−0.1368 π	−0.1615 $d\mu$	+0.038
37		5	8.8	− .055	= x	− .1668	− .1557	+ .062
38		16	7.5	− .059	= x	− .3180	− .1257	− .006
39		17	8.3	− .070	= x	− .3317	− .1229	− .001
40		18	8.6	− .121	= x	− .3450	− .1201	+ .043
41		23	8.6	−0.065	= x	−0.4094	−0.1064	−0.043
42		29	6.9	− .202	= x	− .4819	− .0904	+ .060
43	Dec.	1	7.3	− .251	= x	− .5054	− .0847	+ .097
44		2	6.8	− .195	= x	− .5162	− .0820	+ .035
45		4	6.4	− .163	= x	− .5384	− .0766	− .006
46		7	6.3	−0.129	= x	−0.5704	−0.0739	−0.056
47		9	7.2	− .445	= x	− .5915	− .0628	+ .250
48		14	6.2	− .317	= x	− .6393	− .0492	+ .097
49		16	6.2	− .335	= x	− .6570	− .0438	+ .108
50		24	6.2	− .242	= x	− .7203	− .0219	− .017
51	87 Jan.	5	6.9	−0.227	= x	−0.7881	+0.0118	−0.069
52		8	6.4	− .342	= x	− .7995	+ .0198	+ .043
53		10	6.7	− .274	= x	− .8059	+ .0253	− .031
54		12	6.3	− .254	= x	− .8113	+ .0308	− .054
55		20	6.4	− .473	= x	− .8229	+ .0527	+ .157
56		25	6.3	−0.317	= x	−0.8218	+0.0664	−0.001
57		31	6.5	− .203	= x	− .8120	+ .0829	− .113
58	Feb.	5	6.0	− .326	= x	− .7971	+ .0938	+ .015
59		8	5.9	− .203	= x	− .7851	+ .1048	− .104
60		17	17.1	− .195	= x	− .7335	+ .1306	− .093
61		25	17.4	−0.258	= x	−0.6740	+0.1526	+0.007
62		26	16.9	− .207	= x	− .6658	+ .1553	− .055
63		27	16.9	− .128	= x	− .6572	+ .1581	− .130
64	Mar.	12	16.1	− .002	= x	− .5292	+ .1935	− .204
65		16	15.7	− .155	= x	− .4838	+ .2044	− .033
66		23	16.4	−0.079	= x	−0.3989	+0.2236	−0.075
67		27	14.8	− .166	= x	− .3483	+ .2344	+ .033
68	Apr.	2	15.3	− .074	= x	− .2685	+ .2509	− .026
69		16	14.4	− .002	= x	− .0737	+ .2891	− .017
70		19	14.6	+ .195	= x	− .0308	+ .2973	− .196
71		20	15.0	−0.059	= x	−0.0161	+0.3000	+0.064
72		25	13.4	− .034	= x	+ .0543	+ .3137	+ .068
73		26	14.2	+ .018	= x	+ .0693	+ .3165	+ .023
74		29	13.8	− .004	= x	+ .1115	+ .3246	+ .055
75		30	13.8	+ .232	= x	+ .1256	+ .3272	− .168

No.	Date, 1887.		Equations of Condition.	Residual.
		d. h.	"	"
76	May	5 13.7	$+0.108 = x + 0.1958\,\pi + 0.3410\,d\mu$	-0.015
77		7 13.0	$+ .220 = x + .2231 + .3465$	$- .116$
78		9 12.4	$+ .015 = x + .2503 + .3519$	$+ .100$
79		10 12.8	$+ .122 = x + .2639 + .3546$	$- .001$
80		13 13.0	$- .010 = x + .3046 + .3628$	$+ .149$
81		14 12.8	$+0.066 = x + 0.3177 + 0.3655$	$+0.078$
82		16 12.8	$+ .089 = x + .3439 + .3710$	$+ .066$
83		18 12.8	$+ .005 = x + .3699 + .3765$	$+ .165$
84		20 13.1	$+ .193 = x + .3956 + .3820$	$- .017$
85		26 13.2	$+ .207 = x + .4693 + .3984$	$+ .005$
86		31 11.8	$+0.222 = x + 0.5267 + 0.4120$	$+0.017$

The formation of the normal equation gives the following result:—

$$
\begin{aligned}
+\ 7''.3000 &= +86.0000x - 5.6824\,d\mu + 3.1215\,\pi \\
-\ 4.8285 &= -\ 5.6824 + 7.8594 - 5.6322 \\
+13.7118 &= +\ 3.1215 - 5.6322 + 24.0247.
\end{aligned}
$$

The values of the unknowns are—

$$
\begin{aligned}
x &= +0''.0581 \\
d\mu &= -0.1518 \\
\pi &= +0.4448.
\end{aligned}
$$

The probable error of π is $\pm 0''.0212$, while the probable error of a complete determination of the distance between this star and 61_1 Cygni is $\pm 0''.102$.

RELATIVE PARALLAX OF 61_2 CYGNI AND STAR (C).

TABLE XVII.

Concluded measures of 61_2 Cygni from the comparison Star (c).

No. for Reference.	Date of Exposure of Plate. 1886.		Measured Distance of Star (c) to 61_2 Cygni.	Refraction Correction.	Aberration Correction.	Proper Motion.	Correction to Scale.	Concluded Distance of Star (c) from 61_2 Cygni.	Average Deviation.
		d. h.	"	"	"	"	"	"	"
1	May	30 11.7	1105.150	+0.574	+0.068	+1.962	−0.189	1107.565	0.283
2	June	1 11.7	5.613	.477	.067	1.945	− .302	7.800	.296
3		4 11.8	5.118	.440	.067	1.916	+ .199	7.740	.049
4		8 11.9	5.178	.411	.066	1.880	+ .247	7.782	.176
5		15 11.2	5.217	.433	.064	1.817	+ .172	7.703	.091

No. for Reference.	Date of Exposure of Plate. 1886.			Measured Distance of Star (*c*) to 61_2 Cygni.	Refraction Correction.	Aberration Correction.	Proper Motion.	Correction to Scale.	Concluded Distance of Star (*c*) from 61_2 Cygni.	Average Deviation.
		d.	h.	"	"	"	"	"	"	"
6	June	16	11.7	1106.045	+0.391	+0.064	+1.808	−0.348	1107.960	0.207
7		23	11.6	6.028	.372	.060	1.744	− .244	7.960	.170
8		24	11.6	6.204	.373	.060	1.735	− .637	7.735	.183
9		30	11.4	5.979	.362	.056	1.681	− .328	7.750	.242
10	July	1	11.3	5.612	.363	.056	1.671	+ .350	8.052	.270
11	Aug.	20	11.1	1106.324	+0.329	+0.009	+1.214	−0.021	1107.855	0.135
12		24	9.8	6.161	.331	.004	1.181	+ .157	7.834	.206
13		26	9.3	5.945	.333	+ .002	1.164	+ .459	7.903	.209
14		28	9.5	6.517	.331	.000	1.145	− .198	7.795	.139
15		29	9.5	6.476	.331	− .002	1.135	− .229	7.711	.224
16		30	8.9	1106.370	+0.334	−0.003	+1.125	−0.042	1107.784	0.242
17		31	8.8	6.221	.334	.004	1.117	+ .188	7.856	.265
18	Sept.	7	8.6	6.229	.332	.012	1.055	+ .263	7.867	.129
19		10	8.4	6.443	.332	.012	1.027	+ .047	7.837	.143
20		11	8.5	6.694	.332	.016	1.018	− .088	7.940	.207
21		13	8.4	1106.461	+0.331	−0.019	+1.000	−0.014	1107.759	0.162
22		15	8.1	6.672	.332	.021	0.982	− .178	7.787	.193
23		16	9.8	6.344	.330	.022	.972	+ .177	7.801	.237
24		17	8.1	6.669	.332	.023	.963	− .198	7.743	.182
25		18	8.0	6.887	.331	.024	.954	− .291	7.857	.143
26		20	9.0	1106.182	+0.329	−0.026	+0.935	+0.204	1107.624	0.098
27		22	9.4	6.724	.330	.028	.917	− .324	7.619	.244
28		27	10.2	6.947	.337	.034	.871	− .311	7.810	.139
29		29	8.6	6.413	.329	.035	.854	+ .174	7.735	.182
30		30	8.4	6.835	.329	.037	.845	− .195	7.777	.267
31	Oct.	2	8.2	1106.311	+0.329	−0.038	+0.827	+0.077	1107.506	0.154
32		6	9.1	6.532	.333	.042	.791	+ .121	7.735	.183
33		13	10.1	6.450	.360	.048	.726	− .014	7.474	.129
34		21	7.5	6.495	.330	.055	.655	+ .004	7.429	.244
35		22	7.5	6.515	.330	.055	.645	+ .064	7.499	.192
36	Nov.	3	6.6	1106.608	+0.330	−0.062	+0.537	+0.048	1107.461	0.264
37		5	8.8	6.749	.361	.063	.518	− .163	7.402	.153
38		16	7.5	6.722	.348	.067	.418	− .005	7.416	.202
39		17	8.3	6.751	.372	.067	.409	− .039	7.426	.183
40		18	8.6	6.825	.388	.067	.399	− .172	7.373	.074
41		23	8.6	1106.707	+0.412	−0.068	+0.353	−0.028	1107.376	0.126
42		29	6.9	6.675	.351	.068	.301	− .002	7.257	.305
43	Dec.	1	7.3	6.607	.367	.068	.282	+ .070	7.258	.093
44		2	6.8	6.622	.354	.068	.273	+ .003	7.184	.222
45		4	6.4	6.599	.348	.067	.255	+ .070	7.205	.247

No. for Reference.	Date of Exposure of Plate. 1886–7.			Measured Distance of Star (*c*) to 61_2 Cygni.	Refraction Correction.	Aberration Correction.	Proper Motion.	Correction to Scale.	Concluded Distance of Star (*c*) from 61_2 Cygni.	Average Deviation.
		d.	h.	"	"	"	"	"	"	"
46	Dec.	7	6.3	1106.831	+ 0.352	− 0.067	+ 0.246	− 0.163	1107.199	0.173
47		9	7.2	6.644	.388	.066	.209	− .058	7.117	.139
48		14	6.2	7.269	.360	.064	.164	− .441	7.288	.026
49		16	6.2	6.936	.366	.064	.146	− .220	7.164	.244
50		24	6.2	6.974	.388	.060	.073	− .151	7.224	.180
51	87 Jan.	5	6.9	1107.398	+ 0.534	− 0.052	− 0.039	− 0.656	1107.185	0.045
52		8	6.4	7.037	.478	.049	.066	− .346	7.054	.262
53		10	6.7	6.680	.550	.048	.084	+ .102	7.199	.312
54		12	6.3	7.374	.498	.046	.102	− .599	7.125	.242
55		20	6.4	7.089	.633	.039	.175	− .564	6.944	.183
56		25	6.3	1106.608	+ 0.688	− 0.033	− 0.221	+ 0.151	1107.193	0.127
57		31	6.5	7.010	.941	.027	.276	− .441	7.207	.205
58	Feb.	5	6.0	6.251	.836	.022	.312	+ .346	7.099	.290
59		8	5.9	7.161	.921	.018	.349	− .489	7.226	.226
60		17	17.1	7.192	.824	.006	.435	− .334	7.241	.143
61		25	17.4	1107.160	+ 0.574	+ 0.003	− 0.507	+ 0.073	1107.302	0.162
62		26	16.9	7.191	.685	.004	.516	− .166	7.198	.191
63		27	16.9	6.693	.713	.005	.526	+ .336	7.221	.083
64	Mar.	12	16.1	7.234	.655	.020	.643	+ .130	7.396	.245
65		16	15.7	7.625	.685	.024	.680	− .284	7.370	.127
66		23	16.4	1107.603	+ 0.455	+ 0.032	− 0.743	+ 0.136	1107.483	0.209
67		27	14.8	7.024	.842	.036	.778	+ .172	7.296	.136
68	Apr.	2	15.3	7.502	.518	.042	834	+ .189	7.417	.172
69		16	14.4	7.699	.517	.053	.961	+ .173	7.481	.240
70		19	14.6	7.875	.459	.055	.988	+ .018	7.419	.099
71		20	15.0	1107.641	+ 0.422	+ 0.056	− 0.997	+ 0.497	1107.619	0.183
72		25	13.4	7.940	.600	.059	1.042	− .052	7.505	.244
73		26	14.2	7.947	.455	.060	1.052	+ .039	7.449	.127
74		29	13.8	7.834	.487	.061	1.078	+ .068	7.372	.262
75		30	13.8	8.089	.472	.062	1.087	+ .012	7.548	.240
76	May	5	13.7	1108.527	+ 0.449	+ 0.064	− 1.133	− 0.251	1107.656	0.139
77		7	13.0	8.373	.517	.065	1.151	− .200	7.604	.166
78		9	12.4	8.089	.626	.065	1.169	− .044	7.567	.227
79		10	12.8	8.412	.522	.065	1.178	− .302	7.519	.193
80		13	13.0	8.708	.465	.066	1.205	− .372	7.662	.085
81		14	12.8	1108.447	+ 0.487	+ 0.067	− 1.214	− 0.217	1107.570	0.056
82		16	12.8	8.361	.468	.067	1.233	− .035	7.626	.219
83		18	12.8	8.716	.451	.067	1.251	− .206	7.777	.138
84		20	13.1	8.443	.411	.068	1.269	+ .088	7.741	.250
85		26	13.2	8.410	.386	.068	1.323	+ .121	7.662	.203
86		31	11.8	1108.303	+ 0.442	+ 0.067	− 1.369	+ 0.166	1107.609	0.097

TABLE XVIII.

Equations of Condition formed from the measures of 61_2 Cygni and Star (c).

No.	Date, 1886.			Equations of Condition.	Residual.
		d.	h.	″	″
1	May	30	11.7	$+0.065 = x + 0.5369\,\pi - 0.5908\,d\mu$	+0.203
2	June	1	11.7	$+ .300 = x + .5590 - .5853$	+ .008
3		4	11.8	$+ .240 = x + .5910 - .5771$	+ .071
4		8	11.9	$+ .282 = x + .6310 - .5660$	+ .052
5		15	11.2	$+ .203 = x + .6935 - .5469$	+ .160
6		16	11.7	$+0.460 = x + 0.7029 - 0.5442$	−0.093
7		23	11.6	$+ .460 = x + .7544 - .5250$	− .073
8		24	11.6	$+ .235 = x + .7610 - .5223$	+ .155
9		30	11.4	$+ .250 = x + .7860 - .5059$	+ .149
10	July	1	11.3	$+ .552 = x + .8009 - .5031$	− .147
11	Aug.	20	11.1	$+0.355 = x + 0.7544 - 0.3653$	+0.018
12		24	9.8	$+ .334 = x + .7264 - .3556$	+ .015
13		26	9.3	$+ .403 = x + .7105 - .3501$	− .053
14		28	9.5	$+ .295 = x + .6941 - .3445$	+ .048
15		29	9.5	$+ .211 = x + .6857 - .3418$	+ .128
16		30	8.9	$+0.284 = x + 0.6775 - 0.3392$	+0.052
17		31	8.8	$+ .356 = x + .6687 - .3364$	− .024
18	Sept.	7	8.6	$+ .367 = x + .6010 - .3174$	− .066
19		10	8.4	$+ .337 = x + .5692 - .3091$	− .051
20		11	8.5	$+ .440 = x + .5586 - .3064$	− .159
21		13	8.4	$+0.259 = x + 0.5365 - 0.3009$	+0.012
22		15	8.1	$+ .287 = x + .5139 - .2955$	− .026
23		16	9.8	$+ .301 = x + .5016 - .2925$	− .046
24		17	8.1	$+ .243 = x + .4895 - .2900$	+ .006
25		18	8.0	$+ .357 = x + .4785 - .2872$	− .112
26		20	9.0	$+0.124 = x + 0.4531 - 0.2815$	+0.109
27		22	9.4	$+ .119 = x + .4288 - .2761$	+ .103
28		27	10.2	$+ .310 = x + .3646 - .2623$	− .117
29		29	8.6	$+ .235 = x + .3387 - .2570$	− .054
30		30	8.4	$+ .277 = x + .3255 - .2543$	− .101
31	Oct.	2	8.2	$+0.006 = x + 0.2981 - 0.2488$	+0.167
32		6	9.1	$+ .235 = x + .2436 - .2380$	− .097
33		13	10.1	$- .026 = x + .1433 - .2185$	+ .119
34		21	7.5	$- .071 = x + .0294 - .1969$	+ .113
35		22	7.5	$- .001 = x + .0148 - .1942$	+ .036

No.	Date, 1886–7.	d.	h.	Equations of Condition.	Residual.
				"	"
36	Nov.	3	6.6	$-0.039 = x - 0.1580\,\pi - 0.1615\,d\mu$	-0.002
37		5	8.8	$-\ .098 = x - \ .1880 - \ .1557$	$+\ .042$
38		16	7.5	$-\ .084 = x - \ .3387 - \ .1257$	$-\ .040$
39		17	8.3	$-\ .074 = x - \ .3522 - \ .1229$	$-\ .056$
40		18	8.6	$-\ .127 = x - \ .3654 - \ .1201$	$-\ .009$
41		23	8.6	$-0.124 = x - 0.4292 - 0.1064$	-0.041
42		29	6.9	$-\ .243 = x - \ .5009 - \ .0904$	$+\ .046$
43	Dec.	1	7.3	$-\ .242 = x - \ .5241 - \ .0847$	$+\ .034$
44		2	6.8	$-\ .316 = x - \ .5347 - \ .0820$	$+\ .103$
45		4	6.4	$-\ .295 = x - \ .5564 - \ .0766$	$+\ .073$
46		7	6.3	$-0.301 = x - 0.5879 - 0.0739$	$+0.064$
47		9	7.2	$-\ .383 = x - \ .6086 - \ .0628$	$+\ .136$
48		14	6.2	$-\ .212 = x - \ .6552 - \ .0492$	$-\ .052$
49		16	6.2	$-\ .336 = x - \ .6724 - \ .0438$	$+\ .060$
50		24	6.2	$-\ .276 = x - \ .7335 - \ .0219$	$-\ .029$
51	87 Jan.	5	6.9	$-0.315 = x - 0.7976 + 0.0118$	-0.021
52		8	6.4	$-\ .446 = x - \ .8079 + \ .0198$	$+\ .105$
53		10	6.7	$-\ .301 = x - \ .8139 + \ .0253$	$-\ .043$
54		12	6.3	$-\ .375 = x - \ .8184 + \ .0308$	$+\ .029$
55		20	6.4	$-\ .556 = x - \ .8271 + \ .0527$	$+\ .204$
56		25	6.3	$-0.307 = x - 0.8242 + 0.0664$	-0.046
57		31	6.5	$-\ .293 = x - \ .8121 + \ .0829$	$-\ .056$
58	Feb.	5	6.0	$-\ .401 = x - \ .7954 + \ .0938$	$+\ .059$
59		8	5.9	$-\ .274 = x - \ .7822 + \ .1048$	$-\ .064$
60		17	17.1	$-\ .259 = x - \ .7273 + \ .1306$	$-\ .058$
61		25	17.4	$-0.198 = x - 0.6649 + 0.1526$	-0.094
62		26	16.9	$-\ .302 = x - \ .6564 + \ .1553$	$+\ .014$
63		27	16.9	$-\ .279 = x - \ .6475 + \ .1581$	$-\ .006$
64	Mar.	12	16.1	$-\ .104 = x - \ .5268 + \ .1935$	$-\ .132$
65		16	15.7	$-\ .130 = x - \ .4690 + \ .2044$	$-\ .082$
66		23	16.4	$-0.017 = x - 0.3823 + 0.2236$	-0.160
67		27	14.8	$-\ .204 = x - \ .3308 + \ .2344$	$+\ .048$
68	Apr.	2	15.3	$-\ .083 = x - \ .2498 + \ .2509$	$-\ .039$
69		16	14.4	$-\ .019 = x - \ .0530 + \ .2891$	$-\ .023$
70		19	14.6	$-\ .081 = x - \ .0098 + \ .2973$	$+\ .048$
71		20	15.0	$+0.119 = x + 0.0049 + 0.3000$	$+0.102$
72		25	13.4	$+\ .005 = x + \ .0757 + \ .3137$	$+\ .018$
73		26	14.2	$-\ .051 = x + \ .0907 + \ .3165$	$+\ .070$
74		29	13.8	$-\ .128 = x + \ .1330 + \ .3246$	$+\ .164$
75		30	13.8	$+\ .048 = x + \ .1471 + \ .3272$	$-\ .006$

No.	Date, 1887.	Equations of Condition.	Residual.
	d. h.	$''$	$''$
76	May 5 13.7	$+0.156 = x + 0.2174\,\pi + 0.3410\,d\mu$	−0.085
77	7 13.0	$+ .104 = x + .2445 + .3465$	− .022
78	9 12.4	$+ .067 = x + .2717 + .3519$	+ .027
79	10 12.8	$+ .019 = x + .2853 + .3546$	+ .080
80	13 13.0	$+ .162 = x + .3258 + .3628$	− .046
81	14 12.8	$+0.070 = x + 0.3389 + 0.3655$	+0.051
82	16 12.8	$+ .126 = x + .3649 + .3710$	+ .006
83	18 12.8	$+ .277 = x + .3907 + .3765$	− .130
84	20 13.1	$+ .241 = x + .4162 + .3820$	− .088
85	26 13.2	$+ .162 = x + .4891 + .3984$	+ .020
86	31 11.8	$+0.109 = x + 0.5456 + 0.4120$	+0.097

In this case the resulting normal equation is—

$$
\begin{aligned}
+\;2.\overset{''}{6}78 &= +86.0000x - 5.6824\,d\mu + 2.9746\,\pi \\
-\;3.1824 &= -\;5.6824 + 7.8594 + 5.5518 \\
+11.4924 &= +\;2.9746 + 5.5518 + 25.3062.
\end{aligned}
$$

The values of the unknowns are—

$$
\begin{aligned}
x &= +\overset{''}{0}.0098 \\
d\mu &= -0.0969 \\
\pi &= +0.4320.
\end{aligned}
$$

The probable error of π is $\pm 0''.0190$, and the probable error of one complete determination of distance of this star from 61_2 Cygni is $\pm 0''.088$.

The Table containing the parallactic processes of this star with reference to 61 Cygni conclude, as in former cases, by exhibiting the difference in the measured distance for each night of the star (c) from each of the components of 61 Cygni. The mean of the measures is $10''.247$.

TABLE XIX.

Difference of the measured distances of Star (c) *from* 61_1 *and* 61_2 *Cygni.*

No.	Difference of Measure.	Difference from Mean.	No.	Difference of Measure.	Difference from Mean.	No.	Difference of Measure.	Difference from Mean.
	″	″		″	″		″	″
1	10.286	0.039	31	10.286	0.039	61	10.140	0.107
2	.192	.055	32	.234	.013	62	.295	.048
3	.276	.029	33	.364	.117	63	.351	.104
4	.218	.029	34	.316	.069	64	.302	.055
5	.315	.068	35	.234	.013	65	.175	.072
6	10.225	0.022	36	10.223	0.024	66	10.138	0.109
7	.280	.033	37	.243	.004	67	.238	.009
8	333	.086	38	.225	.022	68	.209	.038
9	.333	.086	39	.204	.043	69	.217	.030
10	.205	.042	40	.206	.041	70	.476	.229
11	10.233	0.014	41	10.259	0.012	71	10.022	0.225
12	.196	.051	42	.241	.006	72	.161	.086
13	.193	.054	43	.191	.056	73	.269	.022
14	.273	.026	44	.321	.074	74	.324	.077
15	.320	.073	45	.332	.085	75	.384	.137
16	10.251	0.004	46	10.372	0.125	76	10.152	0.095
17	.367	.120	47	.138	.109	77	.316	.069
18	.121	.126	48	.095	.152	78	.148	.099
19	.074	.173	49	.201	.046	79	.303	.056
20	.251	.004	50	.234	.013	80	.028	.219
21	10.538	0.291	51	10.288	0.041	81	10.196	0.051
22	.217	.030	52	.304	.057	82	10.163	.084
23	.436	.189	53	.227	.020	83	9.928	.319
24	.470	.223	54	.321	.074	84	10.152	.095
25	.151	.096	55	.283	.036	85	10.245	.002
26	10.265	0.018	56	0.190	0.057	86	10.313	0.066
27	.330	.083	57	.290	.043			
28	.194	.053	58	.275	.028			
29	.354	.107	59	.271	.024			
30	.248	.001	60	.264	.017			

PARALLAX OF 61_1 *CYGNI AND STAR* (D).

Concluded measures of 61_1 *Cygni from the comparison Star* (d).

No. for Reference.	Date of Exposure of Plate. 1886.	Measured Distance of Star (*d*) to 61_1 Cygni.	Refraction Correction.	Aberration Correction.	Proper Motion.	Correction to Scale.	Concluded Distance of Star (*d*) from 61_1 Cygni.	Average Deviation.
	d. h.	″	″	″	″	″	″	″
1	May 30 11.7	955.317	+0.427	+0.058	−2.257	−0.163	953.382	0.262
2	June 1 11.7	5.396	.366	.058	2.235	− .260	3.325	.133
3	4 11.8	4.981	.343	.058	2.205	+ .171	3.348	.157
4	8 11.9	5.029	.325	.057	2.163	+ .212	3.460	.159
5	15 11.2	4.883	.339	.055	2.090	+ .148	3.335	.097
6	16 11.7	955.111	+0.314	+0.055	−2.080	−0.300	953.100	0.247
7	23 11.6	4.899	.302	.052	2.006	− .210	3.037	.225
8	24 11.6	5.244	.303	.051	1.995	− .553	3.050	.303
9	30 11.4	5.036	.297	.049	1.933	− .282	3.167	.085
10	July 1 11.3	4.398	.298	.048	1.922	+ .301	3.123	.162
11	Aug. 20 11.1	954.404	+0.282	+0.007	−1.395	−0.018	953.280	0.139
12	24 9.8	4.284	.282	.004	1.358	+ .135	3.347	.192
13	26 9.3	3.783	.283	.002	1.337	+ .395	3.126	.157
14	28 9.5	4.490	.282	.000	1.316	− .171	3.285	.244
15	29 9.5	5.518	.282	−0.001	1.306	− .197	3.296	.209
16	30 8.9	954.521	+0.283	−0.002	−1.295	−0.036	953.471	0.250
17	31 8.8	3.993	.283	.003	1.285	+ .161	3.149	.133
18	Sept. 7 8.6	3.959	.282	.010	1.212	+ .226	3.245	.182
19	10 8.4	4.406	.282	.011	1.181	+ .040	3.536	.209
20	11 8.5	4.382	.282	.014	1.170	− .076	3.404	.243
21	13 8.4	954.420	+0.282	−0.016	−1.150	−0.012	953.524	0.162
22	15 8.1	4.573	.282	.018	1.129	− .154	3.554	.153
23	16 9.8	4.071	.284	.018	1.118	+ .153	3.372	.180
24	17 8.1	4.564	.282	.019	1.108	− .170	3.549	.243
25	18 8.0	4.469	.282	.021	1.097	− .250	3.383	.292
26	20 9.0	954.047	+0.282	−0.023	−1.076	+0.175	953.405	0.227
27	22 9.4	4.400	.284	.024	1.055	− .278	3.327	.214
28	27 10.2	4.369	.295	.029	1.001	− .268	3.366	.139
29	29 8.6	4.085	.283	.030	0.982	+ .149	3.505	.243
30	30 8.4	4.467	.282	.031	0.971	− .167	3.579	.229
31	Oct. 2 8.2	954.238	+0.282	−0.033	−0.951	+0.066	953.602	0.183
32	6 9.1	4.164	.289	.036	.909	+ .104	3.612	.205
33	13 10.1	4.046	.317	.041	.835	− .012	3.475	.156
34	21 7.5	4.092	.284	.047	.752	+ .004	3.581	.147
35	22 7.5	4.171	.284	.048	.742	+ .055	3.720	.229

No. for Reference.	Date of Exposure of Plate. 1886–7.			Measured Distance of Star (*d*) to 61_1 Cygni.	Refraction Correction.	Aberration Correction.	Proper Motion.	Correction to Scale.	Concluded Distance of Star (*d*) from 61_1 Cygni.	Average Deviation.
		d.	h.	"	"	"	"	"	"	"
36	Nov.	3	6.6	953·926	+0.284	−0.053	−0.617	+0.042	953·582	0.204
37		5	8.8	4.207	·317	·054	·595	− ·141	3·734	·153
38		16	7.5	3·951	·308	·057	·480	− ·004	3·718	·217
39		17	8.3	4·032	·338	·057	·470	− ·033	3·810	·083
40		18	8.6	4·072	·355	·058	·459	− ·148	3·762	·136
41		23	8.6	953·984	+0.383	−0.058	−0.406	−0.024	953·879	0.229
42		29	6.9	3·935	·309	·058	·345	− ·002	3·839	·097
43	Dec.	1	7.3	3·859	·333	·058	·324	+ ·060	3·870	·163
44		2	6.8	3·849	·312	·058	·313	+ ·003	3·793	·242
45		4	6.4	3·810	·306	·058	·293	+ ·060	3·825	·138
46		7	6.3	954·051	+0.310	−0.057	−0.282	−0.141	953·881	0.147
47		9	7.2	3·995	·355	·057	·240	− ·050	4·003	·202
48		14	6.2	4·219	·320	·055	·188	− ·379	3·917	·190
49		16	6.2	3·963	·331	·055	·167	− ·189	3·883	·083
50		24	6.2	3·808	·354	·051	·084	− ·130	3·897	·135
51	87 Jan.	5	6.9	953·884	+0.509	−0.045	+0.045	−0.564	953·829	0.165
52		8	6.4	3·824	·442	·042	·076	− ·297	4·003	·104
53		10	6.7	3·272	·532	·041	·099	+ ·088	3·950	·221
54		12	6.3	3·908	·487	·039	·118	− ·515	3·959	·073
55		20	6.4	3·725	·634	·033	·201	− ·485	4·042	·162
56		25	6.3	952·946	+0.677	−0.029	+0.254	+0.130	953·978	0.290
57		31	6.5	3·139	·949	·023	·317	− ·379	4·003	·183
58	Feb.	5	6.0	2·428	·832	·019	·358	+ ·297	3·896	·240
59		8	5.9	3·020	·928	·015	·401	− ·421	3·913	·126
60		17	17.1	3·083	·586	·006	·500	− ·288	3·875	·233
61		25	17.4	952·721	+0.427	+0.002	+0.583	+0.063	953·796	0.207
62		26	16.9	2·960	·497	·003	·594	− ·142	3·912	·093
63		27	16.9	2·411	·517	·004	·604	+ ·289	3·825	·162
64	Mar.	12	16.1	2·527	·479	·017	·739	+ ·112	3·874	·126
65		16	15.7	2·641	·497	·021	·780	− ·244	3·695	·301
66		23	16.4	952·277	+0.352	+0.027	+0.854	+0.117	953·627	0.175
67		27	14.8	2·117	·543	·031	·896	+ ·148	3·735	·329
68	Apr.	2	15.3	2·154	·391	·036	0·959	+ ·162	3·702	·133
69		16	14.4	1·813	·390	·046	1·104	+ ·148	3·501	·027
70		19	14.6	1·922	·355	·047	1·136	+ ·015	3·475	·144
71		20	15.0	951·477	+0.333	+0.048	+1.146	+0.427	953·431	0.162
72		25	13.4	2·052	·444	·051	1·199	− ·045	3·701	·229
73		26	14.2	1·959	·352	·051	1·209	+ ·033	3·604	·304
74		29	13.8	1·823	·373	·053	1·240	+ ·059	3·548	·143
75		30	13.8	1·955	·363	·053	1·250	+ ·010	3·631	·250

No. for Reference.	Date of Exposure of Plate. 1887.	Measured Distance of Star (*d*) to 61_1 Cygni.	Refraction Correction.	Aberration Correction.	Proper Motion.	Correction to Scale.	Concluded Distance of Star (*d*) from 61_1 Cygni.	Average Deviation.
	d. h.	"	"	"	"	"	"	"
76	May 5 13.7	951.993	+0.345	+0.055	+1.303	−0.216	953.480	0.149
77	7 13.0	1.790	.391	.056	1.324	− .172	3.389	.227
78	9 12.4	1.706	.461	.056	1.345	− .038	3.530	.303
79	10 12.8	1.840	.394	.056	1.355	− .260	3.385	.029
80	13 13.0	1.863	.359	.057	1.386	− .320	3.345	.149
81	14 12.8	951.676	+0.373	+0.057	+1.396	−0.187	953.315	0.085
82	16 12.8	1.653	.362	.058	1.418	− .030	3.461	.153
83	18 12.8	1.688	.349	.058	1.439	− .177	3.357	.242
84	20 13.1	1.392	.325	.058	1.460	+ .076	3.311	.270
85	26 13.2	1.367	.311	.058	1.522	+ .104	3.362	.165
86	31 11.8	951.235	+0.360	+0.058	+1.574	+0.142	953.369	0.136

TABLE XXI.

Equations of Condition formed from the measures of 61_1 Cygni and Star (d).

No.	Date, 1886.	Equations of Condition.	Residual.
	d. h.	"	"
1	May 30 11.7	$-0.218 = x - 0.6444\ \pi - 0.5908\ d\mu$	−0.090
2	June 1 11.7	$-\ .275 = x -\ .6642 -\ .5853$	− .041
3	4 11.8	$-\ .252 = x -\ .6926 -\ .5771$	− .075
4	8 11.9	$-\ .140 = x -\ .7277 -\ .5660$	− .192
5	15 11.2	$-\ .265 = x -\ .7806 -\ .5469$	− .088
6	16 11.7	$-0.500 = x - 0.7876 - 0.5442$	+0.135
7	23 11.6	$-\ .563 = x -\ .8284 -\ .5250$	+ .182
8	24 11.6	$-\ .550 = x -\ .8332 -\ .5223$	+ .167
9	30 11.4	$-\ .433 = x -\ .8579 -\ .5059$	+ .040
10	July 1 11.3	$-\ .477 = x -\ .8611 -\ .5031$	+ .083
11	Aug. 20 11.1	$-0.320 = x - 0.7133 - 0.3653$	−0.005
12	24 9.8	$-\ .253 = x -\ .6774 -\ .3556$	− .056
13	26 9.3	$-\ .474 = x -\ .6582 -\ .3501$	+ .173
14	28 9.5	$-\ .315 = x -\ .6379 -\ .3445$	+ .023
15	29 9.5	$-\ .304 = x -\ .6273 -\ .3418$	+ .017

No.	Date, 1886–7.			Equations of Condition.	Residual.
		d.	h.	"	"
16	Aug.	30	8.9	$-0.129 = x - 0.6173\,\pi - 0.3392\,d\mu$	-0.154
17		31	8.8	$-\ .451 = x - \ .6065 - \ .3364$	$+\ .173$
18	Sept.	7	8.6	$-\ .355 = x - \ .5265 - \ .3174$	$+\ .111$
19		10	8.4	$-\ .064 = x - \ .4900 - \ .3091$	$-\ .164$
20		11	8.5	$-\ .196 = x - \ .4778 - \ .3064$	$-\ .027$
21		13	8.4	$-0.076 = x - 0.4524 - 0.3009$	-0.135
22		15	8.1	$-\ .046 = x - \ .4268 - \ .2955$	$-\ .155$
23		16	9.8	$-\ .228 = x - \ .4130 - \ .2925$	$+\ .033$
24		17	8.1	$-\ .051 = x - \ .4005 - \ .2900$	$-\ .139$
25		18	8.0	$-\ .217 = x - \ .3871 - \ .2872$	$+\ .031$
26		20	9.0	$-0.195 = x - 0.3586 - 0.2815$	$+0.024$
27		22	9.4	$-\ .273 = x - \ .3320 - \ .2761$	$+\ .113$
28		27	10.2	$-\ .234 = x - \ .2619 - \ .2623$	$+\ .104$
29		29	8.6	$-\ .095 = x - \ .2335 - \ .2570$	$-\ .023$
30		30	8.4	$-\ .021 = x - \ .2182 - \ .2543$	$-\ .090$
31	Oct.	2	8.2	$+0.002 = x - 0.1901 - 0.2488$	-0.101
32		6	9.1	$+\ .012 = x - \ .1320 - \ .2380$	$-\ .086$
33		13	10.1	$-\ .125 = x - \ .0264 - \ .2185$	$+\ .096$
34		21	7.5	$-\ .019 = x + \ .0914 - \ .1969$	$+\ .040$
35		22	7.5	$+\ .120 = x + \ .1063 - \ .1942$	$-\ .092$
36	Nov.	3	6.6	$-0.018 = x + 0.2802 - 0.1615$	$+0.120$
37		5	8.8	$+\ .134 = x + \ .3098 - \ .1557$	$-\ .018$
38		16	7.5	$+\ .118 = x + \ .4560 - \ .1257$	$+\ .060$
39		17	8.3	$+\ .210 = x + \ .4689 - \ .1229$	$-\ .026$
40		18	8.6	$+\ .162 = x + \ .4815 - \ .1201$	$+\ .028$
41		23	8.6	$+0.279 = x + 0.5414 - 0.1064$	-0.064
42		29	6.9	$+\ .239 = x + \ .6074 - \ .0904$	$+\ .005$
43	Dec.	1	7.3	$+\ .270 = x + \ .6283 - \ .0847$	$-\ .018$
44		2	6.8	$+\ .193 = x + \ .6379 - \ .0820$	$+\ .064$
45		4	6.4	$+\ .225 = x + \ .6573 - \ .0766$	$+\ .040$
46		7	6.3	$+0.281 = x + 0.6849 - 0.0739$	-0.004
47		9	7.2	$+\ .403 = x + \ .7028 - \ .0628$	$-\ .118$
48		14	6.2	$+\ .317 = x + \ .7424 - \ .0492$	$-\ .015$
49		16	6.2	$+\ .283 = x + \ .7565 - \ .0438$	$+\ .026$
50		24	6.2	$+\ .297 = x + \ .8043 - \ .0219$	$+\ .033$
51	87 Jan.	5	6.9	$+0.229 = x + 0.8458 + 0.0118$	$+0.120$
52		8	6.4	$+\ .403 = x + \ .8502 + \ .0198$	$-\ .052$
53		10	6.7	$+\ .350 = x + \ .8519 + \ .0253$	$+\ .002$
54		12	6.3	$+\ .359 = x + \ .8525 + \ .0308$	$-\ .005$
55		20	6.4	$+\ .442 = x + \ .8444 + \ .0527$	$-\ .093$

No.	Date, 1887.			Equations of Condition.	Residual.
		d.	h.	″	″
56	Jan.	25	6.3	$+0.378 = x + 0.8306\,\pi + 0.0664\,d\mu$	−0.032
57		31	6.5	$+\ .403 = x +\ .8056 +\ .0829$	− .067
58	Feb.	5	6.0	$+\ .296 = x +\ .7783 +\ .0938$	+ .029
59		8	5.9	$+\ .313 = x +\ .7587 +\ .1048$	+ .005
60		17	17.1	$+\ .275 = x +\ .6842 +\ .1306$	+ .013
61		25	17.4	$+0.196 = x + 0.6062 + 0.1526$	+0.060
62		26	16.9	$+\ .312 = x +\ .5958 +\ .1553$	− .060
63		27	16.9	$+\ .225 = x +\ .5851 +\ .1581$	+ .023
64	Mar.	12	16.1	$+\ .274 = x +\ .4307 +\ .1935$	− .089
65		16	15.7	$+\ .095 = x +\ .3782 +\ .2044$	+ .068
66		23	16.4	$+0.027 = x + 0.2819 + 0.2236$	+0.097
67		27	14.8	$+\ .135 = x +\ .2257 +\ .2344$	− .033
68	Apr.	2	15.3	$+\ .102 = x +\ .1384 +\ .2509$	− .036
69		16	14.4	$-\ .099 = x -\ .0683 +\ .2891$	+ .071
70		19	14.6	$-\ .125 = x -\ .1127 +\ .2973$	+ .088
71		20	15.0	$-0.169 = x - 0.1278 + 0.3000$	+0.125
72		25	13.4	$+\ .101 = x -\ .1997 +\ .3137$	− .174
73		26	14.2	$+\ .004 = x -\ .2148 +\ .3165$	− .083
74		29	13.8	$-\ .052 = x -\ .2573 +\ .3246$	− .044
75		30	13.8	$+\ .031 = x -\ .2714 +\ .3272$	− .133
76	May	5	13.7	$-0.120 = x - 0.3411 + 0.3410$	−0.011
77		7	13.0	$-\ .211 = x -\ .3677 +\ .3465$	+ .070
78		9	12.4	$-\ .070 = x -\ .3943 +\ .3519$	− .082
79		10	12.8	$-\ .215 = x -\ .4075 +\ .3546$	+ .057
80		13	13.0	$-\ .255 = x -\ .4467 +\ .3628$	+ .082
81		14	12.8	$-0.285 = x - 0.4592 + 0.3655$	+0.106
82		16	12.8	$-\ .139 = x -\ .4842 +\ .3710$	− .050
83		18	12.8	$-\ .243 = x -\ .5087 +\ .3765$	+ .046
84		20	13.1	$-\ .289 = x -\ .5328 +\ .3820$	+ .081
85		26	13.2	$-\ .238 = x -\ .6008 +\ .3984$	+ .002
86		31	11.8	$-0.231 = x - 0.6523 + 0.4120$	−0.027

The normal equation, after the usual treatment, is of the following form—

$$
\begin{aligned}
-\ 2''.4080 &= +86.0000\,x - 5.6824\,d\mu - \ 3.6889\,\pi \\
+\ 2.6588 &= -\ 5.6824 \quad +7.8594 \quad +\ 5.2392 \\
+11.7980 &= -\ 3.6889 \quad +5.2392 \quad +27.4037
\end{aligned}
$$

whence the values of the unknowns become—

$$
\begin{aligned}
x &= -0''.0064 \\
d\mu &= +0.0541 \\
\pi &= +0.4193.
\end{aligned}
$$

The probable error of π is $0''.0182$, and the probable error in the complete determination of distance for one night is $0''.089$.

PARALLAX OF 61_2 *CYGNI AND STAR* (D).

Concluded measures of 61_2 *Cygni from the comparison Star* (d).

No. for Reference.	Date of Exposure of Plate. 1886.			Measured Distance of Star (*d*) to 61_2 Cygni.	Refraction Correction.	Aberration Correction.	Proper Motion.	Correction to Scale.	Concluded Distance of Star (*d*) from 61_2 Cygni.	Average Deviation.
		d.	h.	"	"	"	"	"	"	"
1	May	30	11.7	963.059	+0.445	+0.059	−2.194	−0.164	961.205	0.092
2	June	1	11.7	3.163	.379	.058	2.173	− .262	1.165	.188
3		4	11.8	2.606	.353	.058	2.142	+ .173	1.048	.240
4		8	11.9	2.756	.335	.057	2.102	+ .214	1.260	.183
5		15	11.2	2.706	.349	.055	2.031	+ .149	1.228	.136
6		16	11.7	963.047	+0.321	+0.055	−2.021	−0.302	961.100	0.274
7		23	11.6	2.809	.312	.052	1.949	− .212	1.012	.225
8		24	11.6	3.258	.313	.052	1.940	− .558	1.125	.243
9		30	11.4	2.992	.305	.050	1.879	− .285	1.183	.211
10	July	1	11.3	2.281	.305	.048	1.868	+ .304	1.070	.096
11	Aug.	20	11.1	962.410	+0.285	+0.007	−1.356	−0.019	961.327	0.243
12		24	9.8	2.182	.284	.004	1.320	+ .136	1.286	.164
13		26	9.3	1.803	.286	.002	1.300	+ .399	1.190	.175
14		28	9.5	2.436	.284	.000	1.279	− .172	1.269	.190
15		29	9.5	2.483	.284	− .001	1.269	− .199	1.298	.151
16		30	8.9	962.390	+0.286	−0.002	−1.259	−0.036	961.379	0.206
17		31	8.8	2.175	.286	.003	1.249	+ .163	1.372	.264
18	Sept.	7	8.6	2.125	.285	.010	1.178	+ .228	1.450	.083
19		10	8.4	2.199	.285	.011	1.147	+ .040	1.366	.320
20		11	8.5	2.354	.284	.014	1.138	− .077	1.409	.242
21		13	8.4	962.267	+0.284	−0.016	−1.117	−0.012	961.406	0.160
22		15	8.1	2.522	.285	.018	1.097	− .155	1.537	.132
23		16	9.8	1.969	.287	.019	1.086	+ .154	1.305	.083
24		17	8.1	2.242	.285	.020	1.077	− .172	1.258	.125
25		18	8.0	2.537	.284	.021	1.066	− .252	1.482	.240
26		20	9.0	961.848	+0.285	−0.023	−1.045	+0.177	961.242	0.203
27		22	9.4	2.245	.287	.025	1.025	− .281	1.201	.132
28		27	10.2	2.319	.297	.029	0.974	− .270	1.343	.153
29		29	8.6	1.879	.285	.031	0.954	+ .151	1.330	.129
30		30	8.4	2.383	.284	.032	0.944	− .169	1.522	.173
31	Oct.	2	8.2	962.004	+0.285	−0.033	−0.924	+0.067	961.399	0.036
32		6	9.1	1.875	.292	.037	.884	+ .105	1.351	.183
33		13	10.1	1.936	.319	.042	.811	− .012	1.390	.272
34		21	7.5	1.918	.289	.047	.731	+ .004	1.433	.209
35		22	7.5	1.916	.287	.048	.720	+ .056	1.491	.138

No. for Reference.	Date of Exposure of Plate. 1886–7.			Measured Distance of Star (*d*) to 61_2 Cygni.	Refraction Correction.	Aberration Correction.	Proper Motion.	Correction to Scale.	Concluded Distance of Star (*d*) from 61_2 Cygni.	Average Deviation.
		d.	h.	"	"	"	"	"	"	"
36	Nov.	3	6.6	961.938	+ 0.287	− 0.054	− 0.600	+ 0.042	961.613	0.163
37		5	8.8	2.053	.324	.055	.578	− .142	1.602	.150
38		16	7.5	1.955	.309	.058	.467	− .004	1.735	.274
39		17	8.3	1.860	.338	.058	.456	− .033	1.651	.083
40		18	8.6	2.027	.353	.058	.446	− .149	1.727	.129
41		23	8.6	961.854	+ 0.380	− 0.059	− 0.394	− 0.024	961.757	0.209
42		29	6.9	1.838	.313	.059	.336	− .002	1.754	.240
43	Dec.	1	7.3	1.848	.333	.059	.314	+ .061	1.869	.130
44		2	6.8	1.830	.314	.059	.305	+ .003	1.783	.122
45		4	6.4	1.808	.309	.059	.284	+ .061	1.835	.084
46		7	6.3	962.033	+ 0.313	− 0.058	− 0.274	− 0.142	961.872	0.053
47		9	7.2	1.853	.354	.057	.233	− .050	1.867	.139
48		14	6.2	2.108	.324	.056	.183	− .383	1.810	.208
49		16	6.2	1.732	.330	.055	.163	− .191	1.653	.280
50		24	6.2	1.855	.351	.052	.081	− .131	1.942	.143
51	87 Jan.	5	6.9	961.781	+ 0.501	− 0.045	+ 0.044	− 0.569	961.712	0.127
52		8	6.4	1.652	.448	.043	.074	− .300	1.831	.173
53		10	6.7	1.180	.526	.041	.094	+ .089	1.848	.164
54		12	6.3	1.701	.476	.040	.115	− .519	1.733	.092
55		20	6.4	1.497	.607	.033	.196	− .489	1.778	.255
56		25	6.3	960.854	+ 0.663	− 0.029	+ 0.247	+ 0.085	961.820	0.139
57		31	6.5	1.044	.931	.023	.308	− .383	1.877	.262
58	Feb.	5	6.0	0.351	.814	.019	.348	+ .300	1.794	.138
59		8	5.9	0.960	.905	.015	.390	− .425	1.815	.083
60		17	17.1	0.920	.620	.006	.486	− .290	1.730	.170
61		25	17.4	960.675	+ 0.445	+ 0.002	+ 0.566	+ 0.063	961.751	0.184
62		26	16.9	0.856	.522	.003	.576	− .144	1.813	.097
63		27	16.9	0.273	.540	.004	.587	+ .292	1.696	.205
64	Mar.	12	16.1	0.273	.501	.017	.719	+ .113	1.624	.162
65		16	15.7	0.475	.521	.021	.759	− .246	1.530	.253
66		23	16.4	960.282	+ 0.364	+ 0.028	+ 0.830	+ 0.118	961.622	0.282
67		27	14.8	60.021	.574	.031	.871	+ .149	1.646	.131
68	Apr.	2	15.3	60.059	.406	.036	.932	+ .164	1.597	.122
69		16	14.4	59.889	.405	.046	1.073	+ .150	1.563	.173
70		19	14.6	60.005	.367	.048	1.103	+ .015	1.538	.119
71		20	15.0	959.535	+ 0.341	+ 0.048	+ 1.114	+ 0.431	961.469	0.042
72		25	13.4	9.889	.463	.051	1.165	− .045	1.523	.130
73		26	14.2	9.738	.364	.052	1.175	+ .033	1.362	.204
74		29	13.8	9.707	.386	.053	1.205	+ .059	1.410	.109
75		30	13.8	9.829	.376	.053	1.215	+ .010	1.483	.443

No. for Reference.	Date of Exposure of Plate. 1887.			Measured Distance of Star (d) to 61_2 Cygni.	Refraction Correction.	Aberration Correction.	Proper Motion.	Correction to Scale.	Concluded Distance of Star (d) from 61_2 Cygni.	Average Deviation.
		d.	h.	"	"	"	"	"	"	"
76	May	5	13.7	960.010	+0.360	+0.055	+1.266	−0.218	961.473	0.260
77		7	13.0	959.811	.412	.056	1.286	− .174	1.391	.132
78		9	12.4	9.565	.482	.057	1.306	− .038	1.372	.155
79		10	12.8	9.889	.409	.057	1.316	− .262	1.409	.127
80		13	13.0	9.825	.370	.057	1.347	− .323	1.276	.208
81		14	12.8	959.701	+0.386	+0.058	+1.357	−0.188	961.314	0.242
82		16	12.8	9.616	.373	.058	1.377	− .030	1.394	.167
83		18	12.8	9.761	.361	.058	1.397	− .179	1.398	.209
84		20	13.1	9.412	.334	.059	1.418	+ .076	1.299	.230
85		26	13.2	9.318	.317	.059	1.478	+ .105	1.277	.154
86		31	11.8	959.164	+0.373	+0.058	+1.530	+0.144	961.269	0.205

TABLE XXIII.

Equations of Condition formed from the measures of 61_2 *Cygni and Star* (d).

No.	Date, 1886.			Equations of Condition.			Residual.
		d.	h.	"			"
1	May	30	11.7	−0.295 = x	−0.6207 π	−0.5908 $d\mu$	+0.035
2	June	1	11.7	− .335 = x	− .6421	− .5853	+ .066
3		4	11.8	− .452 = x	− .6704	− .5771	+ .171
4		8	11.9	− .240 = x	− .7067	− .5660	− .057
5		15	11.2	− .272 = x	− .7620	− .5469	− .048
6		16	11.7	−0.400 = x	−0.7692	−0.5442	+0.077
7		23	11.6	− .488 = x	− .8127	− .5250	+ .146
8		24	11.6	− .375 = x	− .8179	− .5223	+ .031
9		30	11.4	− .317 = x	− .8450	− .5059	− .038
10	July	1	11.3	− .430 = x	− .8486	− .5031	+ .073
11	Aug.	20	11.1	−0.173 = x	−0.7236	−0.3653	−0.129
12		24	9.8	− .214 = x	− .6899	− .3556	− .074
13		26	9.3	− .310 = x	− .6715	− .3501	+ .030
14		28	9.5	− .231 = x	− .6519	− .3445	− .046
15		29	9.5	− .202 = x	− .6420	− .3418	− .055

No.	Date, 1886–7.			Equations of Condition.	Residual.
		d.	h.	″	″
16	Aug.	30	8.9	$-0.121 = x - 0.6322\,\pi - 0.3392\,d\mu$	−0.142
17		31	8.8	$-\ .128 = x - \ .6219 - \ .3364$	− .127
18	Sept.	7	8.6	$-\ .050 = x - \ .5448 - \ .3174$	− .175
19		10	8.4	$-\ .134 = x - \ .5094 - \ .3091$	− .075
20		11	8.5	$-\ .091 = x - \ .4975 - \ .3064$	− .113
21		13	8.4	$-0.094 = x - 0.4728 - 0.3009$	−0.099
22		15	8.1	$+\ .037 = x - \ .4479 - \ .2955$	− .219
23		16	9.8	$-\ .195 = x - \ .4344 - \ .2925$	+ .018
24		17	8.1	$-\ .242 = x - \ .4223 - \ .2900$	+ .070
25		18	8.0	$-\ .018 = x - \ .4092 - \ .2872$	− .158
26		20	9.0	$-0.258 = x - 0.3814 - 0.2815$	+0.104
27		22	9.4	$-\ .299 = x - \ .3552 - \ .2761$	+ .146
28		27	10.2	$-\ .157 = x - \ .2862 - \ .2623$	+ .044
29		29	8.6	$-\ .170 = x - \ .2572 - \ .2570$	+ .069
30		30	8.4	$+\ .022 = x - \ .2444 - \ .2543$	− .117
31	Oct.	2	8.2	$-0.101 = x - 0.2158 - 0.2488$	+0.018
32		6	9.1	$-\ .149 = x - \ .1579 - \ .2380$	+ .091
33		13	10.1	$-\ .110 = x - \ .0534 - \ .2185$	+ .097
34		21	7.5	$-\ .067 = x + \ .0637 - \ .1969$	+ .104
35		22	7.5	$-\ .009 = x + \ .0786 - \ .1942$	+ .051
36	Nov.	3	6.6	$+0.113 = x + 0.2520 - 0.1615$	−0.006
37		5	8.8	$+\ .102 = x + \ .2823 - \ .1557$	+ .030
38		16	7.5	$+\ .235 = x + \ .4297 - \ .1257$	− .039
39		17	8.3	$+\ .151 = x + \ .4429 - \ .1229$	+ .050
40		18	8.6	$+\ .227 = x + \ .4556 - \ .1201$	− .020
41		23	8.6	$+0.257 = x + 0.5165 - 0.1064$	−0.024
42		29	6.9	$+\ .254 = x + \ .5839 - \ .0904$	+ .008
43	Dec.	1	7.3	$+\ .369 = x + \ .6054 - \ .0847$	− .098
44		2	6.8	$+\ .283 = x + \ .6152 - \ .0820$	+ .007
45		4	6.4	$+\ .335 = x + \ .6352 - \ .0766$	− .051
46		7	6.3	$+0.372 = x + 0.6637 - 0.0739$	−0.075
47		9	7.2	$+\ .367 = x + \ .6823 - \ .0628$	− .063
48		14	6.2	$+\ .310 = x + \ .7205 - \ .0492$	+ .012
49		16	6.2	$+\ .153 = x + \ .7384 - \ .0438$	+ .176
50		24	6.2	$+\ .442 = x + \ .7894 - \ .0219$	− .101
51	87 Jan.	5	6.9	$+0.212 = x + 0.8361 + 0.0118$	+0.159
52		8	6.4	$+\ .331 = x + \ .8419 + \ .0198$	+ .043
53		10	6.7	$+\ .348 = x + \ .8426 + \ .0253$	+ .026
54		12	6.3	$+\ .233 = x + \ .8461 + \ .0308$	+ .143
55		20	6.4	$+\ .278 = x + \ .8418 + \ .0527$	+ .096

No.	Date, 1887.			Equations of Condition.	Residual.
		d.	h.	$''$	$''$
56	Jan.	25	6.3	$+0.320 = x + 0.8305\,\pi + 0.0664\,d\mu$	$+0.050$
57		31	6.5	$+\ .377 = x +\ .8085 \quad +\ .0829$	$-\ .016$
58	Feb.	5	6.0	$+\ .294 = x +\ .7836 \quad +\ .0938$	$+\ .056$
59		8	5.9	$+\ .315 = x +\ .7654 \quad +\ .1048$	$-\ .027$
60		17	17.1	$+\ .230 = x +\ .6953 \quad +\ .1306$	$+\ .082$
61		25	17.4	$+0.251 = x + 0.6207 \quad + 0.1526$	$+0.029$
62		26	16.9	$+\ .313 = x +\ .6111 \quad +\ .1553$	$-\ .037$
63		27	16.9	$+\ .196 = x +\ .6004 \quad +\ .1581$	$+\ .075$
64	Mar.	12	16.1	$+\ .124 = x +\ .4510 \quad +\ .1935$	$+\ .084$
65		16	15.7	$+\ .030 = x +\ .3998 \quad +\ .2044$	$+\ .156$
66		23	16.4	$+0.122 = x + 0.3056 \quad + 0.2236$	$+0.023$
67		27	14.8	$+\ .146 = x +\ .2503 \quad +\ .2344$	$-\ .024$
68	Apr.	2	15.3	$+\ .097 = x +\ .1643 \quad +\ .2509$	$-\ .012$
69		16	14.4	$+\ .063 = x -\ .0405 \quad +\ .2891$	$-\ .066$
70		19	14.6	$+\ .038 = x -\ .0847 \quad +\ .2973$	$-\ .016$
71		20	15.0	$-0.031 = x - 0.0997 \quad + 0.3000$	$+0.060$
72		25	13.4	$+\ .023 = x -\ .1715 \quad +\ .3137$	$-\ .083$
73		26	14.2	$-\ .138 = x -\ .1866 \quad +\ .3165$	$+\ .062$
74		29	13.8	$-\ .090 = x -\ .2291 \quad +\ .3246$	$+\ .007$
75		30	13.8	$-\ .017 = x -\ .2432 \quad +\ .3272$	$-\ .073$
76	May	5	13.7	$-0.027 = x - 0.3131 \quad + 0.3410$	-0.093
77		7	13.0	$-\ .109 = x -\ .3400 \quad +\ .3465$	$-\ .022$
78		9	12.4	$-\ .128 = x -\ .3667 \quad +\ .3519$	$-\ .014$
79		10	12.8	$-\ .091 = x -\ .3800 \quad +\ .3546$	$-\ .057$
80		13	13.0	$-\ .224 = x -\ .4196 \quad +\ .3628$	$+\ .058$
81		14	12.8	$-0.186 = x - 0.4323 \quad + 0.3655$	$+0.015$
82		16	12.8	$-\ .106 = x -\ .4575 \quad +\ .3710$	$-\ .076$
83		18	12.8	$-\ .102 = x -\ .4824 \quad +\ .3765$	$-\ .090$
84		20	13.1	$-\ .201 = x -\ .5068 \quad +\ .3820$	$+\ .002$
85		26	13.2	$-\ .223 = x -\ .5761 \quad +\ .3984$	$-\ .010$
86		31	11.8	$-0.231 = x - 0.6288 \quad + 0.4120$	-0.024

In this, the last of the determinations of the parallax of 61_2 Cygni with reference to the four stars of comparison, the normal equation is—

$$\begin{aligned} -\ \overset{''}{0}.6610 &= +86.0000x - 5.6824\,d\mu - 3.7264\,\pi \\ +\ 2.3869 &= -\ 5.6824 \quad + 7.8594 \quad + 5.5518 \\ +11.5690 &= -\ 3.7264 \quad + 5.5518 \quad + 26.8793 \end{aligned}$$

whence the values of the unknowns are—

$$x = +0''.0115$$
$$d\mu = +0.0080$$
$$\pi = +0.4303,$$

and the probable error of π becomes $\pm 0''.0178$, and that of the measure of distance between this star and 61_2 Cygni is $\pm 0''.104$.

As in the case of the stars of comparison (*a*), (*b*), and (*c*), I append a Table exhibiting the difference of the measures of the two components from the same star (*d*). The average difference of the measures is $7''.930$.

TABLE XXIV.

Difference of the measured distances of Star (d) *from* 61_1 *and* 61_2 *Cygni.*

No.	Difference of Measure.	Difference from Mean.	No.	Difference of Measure.	Difference from Mean.	No.	Difference of Measure.	Difference from Mean.
	"	"		"	"		"	"
1	7.823	0.107	21	7.882	0.048	41	7.878	0.052
2	7.840	.090	22	7.983	.053	42	7.915	.015
3	7.700	.230	23	7.933	.003	43	7.999	.019
4	7.800	.130	24	7.709	.221	44	7.990	.060
5	7.893	.037	25	8.099	.169	45	8.010	.080
6	8.000	0.070	26	7.837	0.093	46	7.991	0.061
7	7.975	.045	27	7.874	.056	47	7.864	.066
8	8.075	.145	28	7.977	.047	48	7.893	.037
9	8.016	.086	29	7.825	.105	49	7.770	.160
10	7.947	.017	30	7.943	.013	50	8.045	.115
11	8.047	0.117	31	7.797	0.133	51	7.883	0.047
12	7.939	.009	32	7.739	.191	52	7.828	.102
13	8.064	.134	33	7.915	.015	53	7.898	.032
14	7.984	.054	34	7.852	.078	54	7.774	.156
15	8.002	.072	35	7.771	.159	55	7.736	.194
16	7.908	0.022	36	8.031	0.101	56	7.842	0.088
17	8.223	.293	37	7.868	.062	57	7.874	.056
18	8.205	.275	38	8.017	.087	58	7.898	.032
19	7.830	.100	39	7.841	.089	59	7.902	.028
20	8.005	.075	40	7.965	.035	60	7.845	.085

No.	Difference of Measure.	Difference from Mean.	No.	Difference of Measure.	Difference from Mean.	No.	Difference of Measure.	Difference from Mean.
	"	"		"	"		"	'
61	7.955	0.025	71	8.038	0.108	81	7.999	0.069
62	7.901	.029	72	7.832	.098	82	7.933	.003
63	7.871	.059	73	7.758	.172	83	8.041	.011
64	7.746	.184	74	7.862	.068	84	7.988	.058
65	7.835	.095	75	7.852	.078	85	7.915	.015
66	7.995	0.065	76	7.993	0.063	86	7.900	0.030
67	7.911	.019	77	8.002	.072			
68	7.895	.035	78	7.842	.088			
69	8.062	.132	79	8.024	.092			
70	8.063	.133	80	7.931	.001			

Collecting the results which are given at the end of the discussion of each of the eight determinations of parallax, we have the following results:—

Star's Name.	Mag.	Relative Annual Parallax.	Probable Error of Parallax.	Probable Error of one Complete Measure of Distance.
		61_1 *Cygni.*		
D.M. + 37°, No. 4189	7.9	+ 0.4294	± 0.0162	± 0.091
+ 38 4336	8.8	+ 0.4414	± 0.0222	± 0.115
+ 37 4175	9.0	+ 0.4448	± 0.0212	± 0.102
+ 38 4348	9.5	+ 0.4193	± 0.0182	± 0.089
		61_2 *Cygni.*		
D.M. + 37°, No. 4189	7.9	+ 0.4250	± 0.0176	± 0.099
+ 38 4336	8.8	+ 0.4508	± 0.0191	± 0.100
+ 37 4175	9.0	+ 0.4320	± 0.0190	± 0.088
+ 38 4348	9.5	+ 0.4303	± 0.0178	± 0.104

These results taken in connection with the probable errors, point to almost an identity of parallax, and suggest that all the four comparison stars probably belong to a remote system not containing 61 Cygni: under this view possibly the average of the eight results [0".437] may be a close approximation to the absolute parallax*; but it is a point submitted to the consideration of astronomers whether we are ever justified in adopting a mean of independent results, referred to various stars, as representing the absolute parallax.

Assuming, however, this mean (0".437) to represent virtually an absolute parallax, and adopting the period of revolution and the Semi-axis major, assigned in the researches of Prof. Peters †, there results from the combination,

* This is further confirmed by the determination of the absolute parallaxes (0".50) referred to p. 98.

† *Ast. Nach.*, No. 2709.

a mass equal to ·505 that of the Sun, for the combined mass of the components of the star 61 Cygni.

There arises naturally the additional question, how far do the distances of the two components of 61 Cygni from each other at a given epoch, as implied in the foregoing results, agree with the same distances, at the same epoch, as obtained by Prof. Peters in his theoretical discussion of the orbit? On referring for this purpose to Table XXIV, it appears that the (mean) difference of the distances of 61_1 Cygni and 61_2 Cygni from (*d*) is 7″·93, for Jan. 1887. Also, on applying obvious reductions to the results of Prof. Peters, the same quantity for the same epoch is 7″·87. The following short Table (XXV) contains the collected results arising from the application of a similar method to Tables VII, XII, and XIX.

TABLE XXV.

Distance of 61_1 to 61_2 Cygni resolved in the direction joining 61_1 and the star.	The same distances from Prof. Peters' Elements.	Difference c−o.
″	″	″
a......20.29	20.34	−0.05
b......20.59	20.64	+0.05
c......10.25	10.33	+0.08
d...... 7.93	7.87	−0.06

Taking into account the multiplied considerations on which these comparisons are founded, the foregoing enquiry exhibits a satisfactory agreement between the results of Prof. Peters' investigations, and those in the preceding pages.

PARALLAX OF μ CASSIOPEIÆ.

The next star submitted to the photographic method is μ Cassiopeiæ—a star well known for its abnormal proper motion. Independently of this consideration, I was influenced in the selection of the star by the fact that its parallax had already been investigated by two eminent astronomers, Bessel and Otto von Struve, with very different results: since, however, the stars of comparison are different in each case, no conclusion can be properly drawn from the disagreement of the final results.

Having in the case of 61 Cygni given every particular requisite for the examination of the work, it is unnecessary to introduce the same amount of detail in the discussion of the parallax of this star. I therefore propose to confine myself solely to furnishing such data as are necessary for tracing the

sequences of the operations leading to the final result. These data will embrace the variation in the diagonals of reference (Table I), the original measures of distance and the total amount of correction applied (Table II), and the final equations of condition (Tables III and IV).

In the course of the observation of this star there were so many unavoidable interruptions, owing to the rehabilitation of the De La Rue Instrument and other causes, that it was not possible to maintain the series without considerable breaks, and therefore it became necessary to base the parallax, in this instance alone, on not more than two stars of comparison. The two stars of comparison selected are—

(star *a*) . . . . . D.M. + 54°, No. 225, Magnitude 7.9 *

(star *b*) . . . . . D.M. + 53°, No. 218 „ 8.3

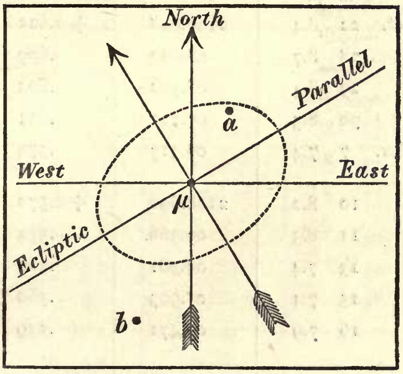


DIAGRAM SHOWING THE RELATIVE POSITIONS OF THE STARS COMPARED WITH μ CASSIOPEIÆ.

The approximate position-angles, and distances of these two stars shown in the diagram are respectively—

(star *a*) . . . . $p = 26^\circ\ 56'$ $s = 755''$

(star *b*) . . . . $p = 201\ 52$ $s = 1356$

whence the expressions for computing the factors for parallax are—

(star *a*) . . $ds = R\,[9.96649]\cos(\odot - 332^\circ\ 5')$

(star *b*) . . $ds = R\,[9.95523]\cos(\odot - 156\ 14)$.

The proper motion for μ Cassiopeiæ has been assumed from various authorities

in R.A. = $+0^s.388$ in Decl^n. $-1''.581$,

or $3''.741$ in the arc of a great circle inclined at an angle $115^\circ\ 0'$ to the parallel of declination.

These preliminary data will, with the explanatory detail furnished in the case of 61 Cygni, permit the whole of the subsequent Tables to be easily followed.

* These magnitudes have been determined photometrically, by the Wedge Photometer. This remark applies to the magnitude assigned to all subsequent stars of comparison.

TABLE I.

Measures of the diagonal distance of Star (a) *from Star* (b) *for the determination, at the times of exposure, of the correction to their measured distances from μ Cassiopeiæ.*

No. for Reference.	Date of Exposure of Plate. 1886–7.	Measured Distance of (*a*) to (*b*) in Arc.	Sum of Corrections of Refraction and Aberration.	Difference from Assumed Mean (2109″.80).
	d. h.	″	″	″
1	86 Oct. 22 8.4	2109.048	+0.625	+0.127
2	28 8.7	08.633	.609	+ .558
3	29 8.4	08.332	.605	+ .863
4	30 8.5	09.721	.601	− .522
5	Nov. 7 7.4	09.317	.579	− .096
6	10 8.2	2108.890	+0.572	+0.338
7	11 8.3	09.366	.574	− .137
8	13 7.4	09.581	.566	− .347
9	15 7.4	08.905	.560	+ .335
10	16 7.9	09.471	.559	− .230
11	18 8.3	2109.418	+0.549	−0.167
12	29 6.3	09.308	.524	− .032
13	30 6.6	09.006	.523	+ .271
14	Dec. 12 7.6	08.892	.492	+ .416
15	13 7.5	09.756	.489	− .445
16	21 6.7	2108.923	+0.476	+0.401
17	22 7.5	09.601	.471	− .272
18	87 Jan. 17 7.2	08.971	.458	+ .371
19	18 7.0	09.382	.454	− .036
20	Feb. 2 7.4	09.110	.515	+ .175
21	4 8.1	2109.534	+0.589	−0.323
22	9 7.4	08.699	0.561	+ .544
23	12 9.5	08.385	1.084	+ .331
24	25 8.3	08.912	0.908	− .020
25	Mar. 1 9.5	08.004	1.721	+ .075
26	2 10.0	2107.950	+2.303	−0.453
27	17 10.7	06.455	3.870	− .525
28	25 10.5	04.958	4.117	+ .725
29	Apr. 4 10.4	06.350	4.112	− .662
30	6 9.9	06.130	4.253	− .583

No. for Refer-ence.	Date of Exposure of Plate. 1887.			Measured Distance of (*a*) to (*b*) in Arc.	Sum of Corrections of Refraction and Aberration.	Difference from Assumed Mean (2109″.80).
		d.	h.	″	″	″
31	Apr.	25	9.9	2103.713	+5.556	+0.531
32	July	31	11.9	09.580	0.745	− .525
33	Aug.	1	10.6	08.604	.775	+ .421
34		2	11.4	09.074	.751	−.025
35		8	11.2	09.877	.750	− .827
36		18	10.1	2108.732	+0.743	+0.325
37		20	12.2	09.288	.741	− .229
38		24	11.3	09.359	.734	− .293
39	Sept.	5	11.0	09.527	.723	− .450
40		7	9.0	08.667	.716	+ .417
41		12	9.1	2108.967	+0.707	+0.126
42		22	9.2	08.839	.690	+ .271
43		28	9.8	09.044	.685	+ .071
44	Oct.	4	10.2	09.834	.670	− .704
45		11	8.6	08.732	.651	+ .417
46		12	8.8	2108.619	+0.650	+0.531
47		13	9.0	09.834	.649	− .683
48		14	9.6	09.617	.647	− .464
49		15	10.4	09.447	.640	− .287
50		17	9.2	08.891	.638	+ .271
51		20	9.2	2108.770	+0.623	+0.407
52		22	10.0	09.624	.623	− .447
53		24	9.4	09.104	.618	+ .078

TABLE II.

Concluded measures of μ Cassiopeiæ from the Stars of comparison.

No. for Refer-ence.	Date of Exposure of Plate. 1886.			Measured Distance of Star (*a*) to μ Cassiop.	Sum of Corrections.	Concluded Distance of Star (*a*).	Measured Distance of Star (*b*) to μ Cassiopeiæ.	Sum of Corrections.	Concluded Distance of Star (*b*).
		d.	h.	″	″	″	″	″	″
1	Oct.	22	8.4	755.393	+0.245	755.638	1355.820	+0.443	1356.263
2		28	8.7	5.110	.385	5.495	5.607	.712	6.319
3		29	8.4	4.868	.505	5.373	5.280	.907	6.187
4		30	8.5	5.663	.008	5.671	6.078	.015	6.093
5	Nov.	7	7.4	5.378	.155	5.533	5.967	.280	6.247

No. for Reference.	Date of Exposure of Plate. 1886–7.		Measured Distance of Star (*a*) to μ Cassiop.	Sum of Corrections.	Concluded Distance of Star (*a*).	Measured Distance of Star (*b*) to μ Cassiopeiæ.	Sum of Corrections.	Concluded Distance of Star (*b*).
	d.	h.	"	"	"	"	"	"
6	86 Nov. 10	8.2	755.231	+0.307	755.538	1355.827	+0.545	1356.372
7	11	8.3	5.242	.137	5.379	5.917	.250	6.167
8	13	7.4	5.676	.027	5.703	6.083	.049	6.132
9	15	7.4	5.371	.304	5.675	5.854	.547	6.401
10	16	7.9	5.444	.103	5.547	6.082	.183	6.265
11	18	8.3	755.430	+0.242	755.672	1355.825	+0.435	1356.260
12	29	6.3	5.300	.189	5.489	5.844	.339	6.183
13	30	6.6	5.646	.090	5.736	6.191	.143	6.334
14	Dec. 12	7.6	5.654	.020	5.674	6.240	.037	6.277
15	13	7.5	5.376	.327	5.703	5.512	.587	6.099
16	21	6.7	755.549	+0.023	755.572	1356.269	+0.043	1356.312
17	22	7.5	5.312	.273	5.585	5.851	.469	6.320
18	87 Jan. 17	7.2	5.453	.038	5.491	6.121	.064	6.185
19	18	7.0	5.508	.179	5.687	5.846	.323	6.169
20	Feb. 2	7.4	5.403	.135	5.538	6.116	.231	6.347
21	4	8.1	755.371	+0.344	755.715	1355.651	+0.600	1356.251
22	9	7.4	5.455	.033	5.488	6.111	.022	6.133
23	12	9.5	5.256	.301	5.557	5.679	.495	6.174
24	25	8.3	5.205	.364	5.569	5.700	0.617	6.317
25	Mar. 1	9.5	5.009	.635	5.644	5.021	1.075	6.096
26	2	10.0	754.445	+0.968	755.413	1354.537	+1.748	1356.285
27	17	10.7	4.107	1.571	5.678	3.983	2.330	6.313
28	25	10.5	4.498	1.205	5.703	3.849	2.283	6.132
29	Apr. 4	10.4	3.905	1.670	5.575	3.391	2.776	6.167
30	6	9.9	3.954	1.711	5.665	3.103	3.202	6.305
31	25	9.9	753.972	+1.481	755.453	1352.710	+3.428	1356.138
32	July 31	11.9	4.917	0.528	5.445	5.375	0.934	6.309
33	Aug. 1	10.6	5.179	.195	5.374	5.936	0.350	6.286
34	2	11.4	5.159	.348	5.507	5.808	0.617	6.425
35	8	11.2	5.234	.279	5.513	5.994	0.439	6.433
36	18	10.1	755.239	+0.226	755.465	1355.893	+0.404	1356.297
37	20	12.2	4.858	.429	5.287	5.561	.751	6.312
38	24	11.3	5.052	.452	5.504	5.406	.791	6.197
39	Sept. 5	11.0	4.914	.507	5.421	5.474	.891	6.365
40	7	9.0	5.181	.193	5.374	6.105	.334	6.439
41	12	9.1	755.241	+0.297	755.538	1355.857	+0.515	1356.372
42	22	9.2	5.324	.243	5.567	5.831	0.416	6.247
43	28	9.8	5.174	.315	5.489	5.682	0.543	6.225
44	Oct. 4	10.2	4.749	.584	5.333	5.427	1.035	6.462
45	11	8.6	5.122	.184	5.306	5.823	0.527	6.350

No. for Reference.	Date of Exposure of Plate. 1887.	Measured Distance of Star (*a*) to μ Cassiop.	Sum of Corrections.	Concluded Distance of Star (*a*).	Measured Distance of Star (*b*) to μ Cassiopeiæ.	Sum of Corrections.	Concluded Distance of Star (*b*).
	d. h.	″	″	″	″	″	″
46	Oct. 12 8.8	755.377	+0.142	755.519	1356.053	+0.232	1356.285
47	13 9.0	5.009	.577	5.586	5.216	1.013	6.229
48	14 9.6	5.115	.518	5.633	5.561	0.872	6.433
49	15 10.4	5.124	.433	5.557	5.627	0.755	6.382
50	17 9.2	5.470	.233	5.703	5.869	0.396	6.265
51	20 9.2	755.309	+0.179	755.488	1355.890	+0.303	1356.193
52	22 10.0	5.068	.486	5.554	5.475	.851	6.326
53	24 9.4	5.330	.297	5.627	5.737	.512	5.249

NOTES.

No. 3. A plate rejected: the film was injured in development.
No. 5. Hazy sky: exposure eight minutes.
No. 6. Images elongated. Driving-clock went too slowly.
No. 7. Sky generally cloudy. Images feeble.
No. 11. The measures on one of the plates discordant nearly 3″. The plate was rejected, but the cause of the discordance could not be discovered.
No. 15. Images faint and elongated in the direction of diurnal motion.
No. 17. Sky very foggy: exposure ten minutes; only three plates taken.
No. 20. Images of the stars (*a*) and (*b*) faint. One plate could not be measured.
Nos. 23 to 31. The exposure was ten minutes in each case, the star being of small altitude.
No. 26. A plate rejected for discordance, the source of which could not be detected.
No. 29. Images elongated in the direction of diurnal motion.
No. 31. Images faint and blurred: it was suspected that the plate was not quite in the focus.
No. 38. A plate rejected, the film having been injured.
No. 40. Observations repeatedly interrupted by clouds.
No. 43. Sky very foggy: exposure was continued for ten minutes.
No. 46. Sky very transparent but definition very bad: the images were large and ill-defined.
No. 51. Sky generally cloudy: the durations of exposure about ten minutes, but a little uncertain owing to passing cloud.
No. 53. Images somewhat elliptical.

It is worthy of remark that the imperfections detailed in the above notes are not exhibited in the residuals.

TABLE III.

Equations of Condition formed from the measures of μ Cassiopeiæ and Star (a) *Table II.*

No.	Date, 1886.	Equations of Condition.	Residuals.
	d. h.	″	″
1	Oct. 22 8.4	$-0.162 = x - 0.4976\,\pi - 0.1952\,d\mu$	−0.082
2	28 8.7	$-\ .305 = x - \ .4132 \ - \ .1788$	+ .064
3	29 8.4	$-\ .427 = x - \ .3988 \ - \ .1750$	+ .187
4	30 8.5	$-\ .129 = x - \ .3841 \ - \ .1724$	− .110
5	Nov. 7 7.4	$-\ .267 = x - \ .2640 \ - \ .1504$	+ .032

No.	Date, 1886–7.			Equations of Condition.	Residuals.
		d.	h.	″	″
6	86 Nov.	10	8.2	$-0.262 = x - 0.2170\,\pi - 0.1422\,d\mu$	+0.029
7		11	8.3	$-\ .421 = x -\ .2012 -\ .1395$	+ .189
8		13	7.4	$-\ .097 = x -\ .1700 -\ .1340$	− .135
9		15	7.4	$-\ .125 = x -\ .1382 -\ .1285$	− .105
10		16	7.9	$-\ .253 = x -\ .1218 -\ .1257$	+ .024
11		18	8.3	$-0.128 = x - 0.0898 - 0.1203$	−0.100
12		29	6.3	$-\ .311 = x -\ .0727 -\ .0903$	+ .082
13		30	6.6	$-\ .064 = x -\ .0565 -\ .0875$	− .164
14	Dec.	12	7.6	$-\ .126 = x +\ .2919 -\ .0546$	− .087
15		13	7.5	$-\ .097 = x +\ .3071 -\ .0519$	− .115
16		21	6.7	$-0.228 = x + 0.4249 - 0.0300$	+0.021
17		22	7.5	$-\ .215 = x +\ .4394 -\ .0272$	+ .009
18	87 Jan.	17	7.2	$-\ .309 = x +\ .7492 +\ .0446$	+ .115
19		18	7.0	$-\ .113 = x +\ .7584 +\ .0473$	− .077
20	Feb.	2	7.4	$-\ .262 = x +\ .8662 +\ .0885$	+ .072
21		4	8.1	$-0.085 = x + 0.8762 + 0.0940$	−0.106
22		9	7.4	$-\ .312 = x +\ .8960 +\ .1077$	+ .123
23		12	9.5	$-\ .243 = x +\ .9051 +\ .1158$	+ .052
24		25	8.3	$-\ .231 = x +\ .9137 +\ .1515$	+ .039
25	Mar.	1	9.5	$-\ .156 = x +\ .9068 +\ .1625$	− .038
26		2	10.0	$-0.387 = x + 0.9043 + 0.1654$	+0.193
27		17	10.7	$-\ .122 = x +\ .8358 +\ .2064$	− .077
28		25	10.5	$-\ .097 = x +\ .7759 +\ .2283$	− .107
29	Apr.	4	10.4	$-\ .225 = x +\ .6805 +\ .2558$	+ .015
30		6	9.9	$-\ .135 = x +\ .6592 +\ .2614$	− .078
31		25	9.9	$-0.347 = x + 0.4192 + 0.3134$	+0.121
32	July	31	11.9	$-\ .355 = x -\ .8602 +\ .5791$	+ .050
33	Aug.	1	10.6	$-\ .426 = x -\ .8659 +\ .5816$	+ .121
34		2	11.4	$-\ .293 = x -\ .8722 +\ .5844$	− .013
35		8	11.2	$-\ .287 = x -\ .9018 +\ .6008$	− .021
36		18	10.1	$-0.335 = x - 0.9307 + 0.6281$	+0.024
37		20	12.2	$-\ .513 = x -\ .9335 +\ .6340$	+ .200
38		24	11.3	$-\ .296 = x -\ .9354 +\ .6448$	− .017
39	Sept.	5	11.0	$-\ .379 = x -\ .9158 +\ .6777$	+ .065
40		7	9.0	$-\ .426 = x -\ .9094 +\ .6829$	+ .113
41		12	9.1	$-0.262 = x - 0.8872 + 0.6968$	−0.051
42		22	9.2	$-\ .233 = x -\ .8241 +\ .7241$	− .077
43		28	9.8	$-\ .311 = x -\ .7743 +\ .7404$	+ .001
44	Oct.	4	10.2	$-\ .467 = x -\ .7165 +\ .7571$	+ .160
45		11	8.6	$-\ .494 = x -\ .6402 +\ .7764$	+ .189

No.	Date, 1887.			Equations of Condition.	Residuals.
		d.	h.	$''$	$''$
46	Oct.	12	8.8	$-0.281 = x - 0.6282\,\pi + 0.7788\,d\mu$	−0.023
47		13	9.0	$-\ .214 = x - \ .6161 + \ .7817$	− .090
48		14	9.6	$-\ .167 = x - \ .6039 + \ .7841$	− .136
49		15	10.4	$-\ .243 = x - \ .5910 + \ .7869$	− .061
50		17	9.2	$-\ .097 = x - \ .5664 + \ .7925$	− .205
51		20	9.2	$-0.311 = x - 0.5273 + 0.8007$	+0.011
52		22	10.0	$-\ .246 = x - \ .4998 + \ .8061$	− .053
53		24	9.4	$-\ .173 = x - \ .4729 + \ .8115$	− .125

Treating these equations in the usual method, the following normal equations result:—

$$\begin{aligned} -13''.450 &= +53.0000\,x + 15.8896\,d\mu - 7.2879\,\pi \\ -\ 4.793 &= +15.8896 \quad +12.0072 \quad -\ 9.3522 \\ +\ 3.375 &= -\ 7.2879 \quad -\ 9.3522 \quad +23.5312 \end{aligned}$$

whence, by solution, are obtained the values of the unknowns, viz.—

$$\begin{aligned} x &= -0''.230 \\ d\mu &= -0.0555 \\ \pi &= +0.0501. \end{aligned}$$

It further appears that the probable error of one complete measure of distance is $\pm 0''.106$, and that the probable error of the determination of π is $\pm 0''.0269$.

TABLE IV.

Equations of Condition formed from the measures of μ Cassiopeiæ and Star (b), *as given in Table II.*

No.	Date, 1886.			Equations of Condition.	Residuals.
		d.	h.	$''$	$''$
1	Oct.	22	8.4	$+0.263 = x + 0.5382\,\pi - 0.1952\,d\mu$	−0.015
2		28	8.7	$.319 = x + \ .4595 - \ .1788$	− .071
3		29	8.4	$.187 = x + \ .4459 - \ .1750$	+ .060
4		30	8.5	$.093 = x + \ .4321 - \ .1724$	+ .154
5	Nov.	7	7.4	$.247 = x + \ .3184 - \ .1504$	− .000

No.	Date, 1886–7.			Equations of Condition.	Residuals.
		d.	h.	″	″
6	86 Nov.	10	8.2	$+0.372 = x + 0.2737\,\pi - 0.1422\,d\mu$	-0.125
7		11	8.3	$.167 = x + .2585 - .1395$	$+ .079$
8		13	7.4	$.132 = x + .2286 - .1340$	$+ .115$
9		15	7.4	$.401 = x + .1981 - .1285$	$- .155$
10		16	7.9	$.265 = x + .1823 - .1257$	$- .019$
11		18	8.3	$+0.260 = x + 0.1514 - 0.1203$	-0.015
12		29	6.3	$.183 = x - .0199 - .0903$	$+ .061$
13		30	6.6	$.334 = x - .0357 - .0875$	$- .091$
14	Dec.	12	7.6	$.277 = x - .2228 - .0546$	$- .035$
15		13	7.5	$.099 = x - .2380 - .0519$	$+ .143$
16		21	6.7	$+0.312 = x - 0.3561 - 0.0300$	-0.072
17		22	7.5	$.320 = x - .3707 - .0272$	$- .080$
18	87 Jan.	17	7.2	$.185 = x - .6915 + .0446$	$+ .053$
19		18	7.0	$.169 = x - .7013 + .0473$	$+ .069$
20	Feb.	2	7.4	$.347 = x - .8213 + .0885$	$- .108$
21		4	8.1	$+0.251 = x - 0.8333 + 0.0940$	-0.013
22		9	7.4	$.133 = x - .8580 + .1077$	$+ .106$
23		12	9.5	$.174 = x - .8704 + .1158$	$+ .066$
24		25	8.3	$.317 = x - .8935 + .1515$	$- .076$
25	Mar.	1	9.5	$.096 = x - .8913 + .1625$	$+ .146$
26		2	10.0	$+0.285 = x - 0.8900 + 0.1654$	-0.043
27		17	10.7	$.313 = x - .8395 + .2064$	$- .067$
28		25	10.5	$.132 = x - .7845 + .2283$	$+ .118$
29	Apr.	4	10.4	$.167 = x - .7058 + .2558$	$+ .086$
30		6	9.9	$.305 = x - .6864 + .2614$	$- .052$
31		25	9.9	$+0.138 = x - 0.5111 + 0.3134$	$+0.122$
32	July	31	11.9	$.309 = x + .8092 + .5791$	$- .012$
33	Aug.	1	10.6	$.286 = x + .8159 + .5816$	$+ .021$
34		2	11.4	$.425 = x + .8228 + .5844$	$- .118$
35		8	11.2	$.433 = x + .8580 + .6008$	$- .124$
36		18	10.1	$+0.297 = x + 0.8968 + 0.6281$	$+0.015$
37		20	12.2	$.312 = x + .9018 + .6340$	$.000$
38		24	11.3	$.197 = x + .9089 + .6448$	$+0.116$
39	Sept.	5	11.0	$.365 = x + .9026 + .6777$	-0.049
40		7	9.0	$.439 = x + .8980 + .6829$	-0.123
41		12	9.1	$+0.372 = x + 0.8821 + 0.6968$	-0.055
42		22	9.2	$.247 = x + .8312 + .7241$	$+ .070$
43		28	9.8	$.225 = x + .7883 + .7404$	$+ .092$
44	Oct.	4	10.2	$.462 = x + .7374 + .7571$	$- .144$
45		11	8.6	$.350 = x + .6690 + .7764$	$- .033$

No.	Date, 1887.			Equations of Condition.	Residuals.
		d.	h.	″	″
46	Oct.	12	8.8	$+0.285 = x + 0.6583\,\pi + 0.7788\,d\mu$	+0.032
47		13	9.0	$.229 = x + .6473 + .7817$	+ .088
48		14	9.6	$.433 = x + .6361 + .7841$	− .116
49		15	10.4	$.382 = x + .6240 + .7869$	− .065
50		17	9.2	$.265 = x + .6016 + .7925$	+ .051
51		20	9.2	$+0.193 = x + 0.5656 + 0.8007$	+0.124
52		22	10.0	$.326 = x + .5403 + .8061$	− .010
53		24	9.4	$.249 = x + .5152 + .8115$	+ .067

The normal equation for the determination of the unknowns is—

$$\begin{aligned} +14\overset{''}{.}524 &= +53.0000\,x + 15.8896\,d\mu + 7.7760\,\pi \\ +4.998 &= +15.8896 + 12.0072 + 9.3356 \\ +3.076 &= +7.7760 + 9.3356 + 23.1828 \end{aligned}$$

whence, by solution, the following values are obtained :—

$$\begin{aligned} x &= +0\overset{''}{.}250 \\ d\mu &= +0.0685 \\ \pi &= +0.0211. \end{aligned}$$

The discussion of the residuals, printed in the last column, shows that the probable error of one complete measure of distance is $\pm 0''.0915$, and that the probable error of the determination of parallax is $\pm 0''.0234$, nearly identical with that obtained from the discussion of the measures of the other star.

It will be seen, on referring to page 73, that the results of the present investigation are :—

Parallax of μ Cassiopeiæ.

I. Referred to star (*a*) $\pi = +0\overset{''}{.}051 \pm 0\overset{''}{.}027.$

II. Referred to star (*b*) $\pi = +0.021 \pm 0.023.$

It is interesting to note that Bessel's determination of this parallax is a small negative quantity; Dr. Otto von Struve assigned the considerable value $+0''.342$: the result here is to exhibit a very small positive parallax, approaching that assigned by Bessel, and possibly explanatory of his negative determination; if this be so, we may assume that μ Cassiopeiæ and the stars (*a*) and (*b*) are possibly in the same system.

PARALLAX OF POLARIS.

The star next selected for the application of the new method is the historical star Polaris. Its parallax has already been determined, among others, by F. W. Struve, and C. A. F. Peters. Their determinations are *absolute*, and are derived from discussions of Right Ascension, made respectively at Dorpat and Pulkova. In applying the photographic method, difficulties were anticipated

arising from the comparative closeness of the two components and their great contrast in brilliancy. Owing to the great variations in the character of the images of these stars from night to night, it was feared that a possible coalescence of the two stars on the plate, might give rise to imperfections of the measurements: but happily, and as a matter of fact, no practical inconvenience of the sort has occurred; in all cases the two images were distinct, and the measures taken from the brighter star could be satisfactorily effected. It will be seen in the sequel that the error of observation in the measurements of this star is not greater than is the case with any other of the stars examined.

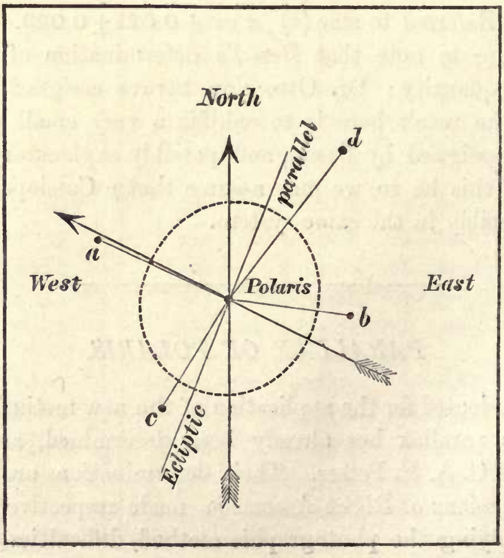
The stars selected for comparison are as follows:—

D.M. 88°, No.	2,	Magnitude	8.8,	designated as	(*a*)
„	9	„	8.0	„	(*b*)
„	4	„	7·5	„	(*c*)
„	10	„	9.0	„	(*d*)

Owing to the proximity of this star to the Pole, it has not been practicable to determine the angle of position of the comparison stars from the photographic plate, a practice which has been adopted in the other cases. For this purpose therefore the co-ordinates given in the Redhill Catalogue for the equinox 1855.0 have been assumed and have been brought up rigorously to the equinox of 1888, with the following result:—

a,—D.M. 88°, No.	2,	$\alpha = 3^{\circ}\ 37'\ 43''$,	$\delta = +88^{\circ}\ 49'\ 26''.1$.
b,— „	9,	$\alpha = 31\ 51\ 41$,	$\delta = +88\ 38\ 45.0$.
c,— „	4,	$\alpha = 13\ \ 7\ 33$,	$\delta = +88\ 25\ 21.1$.
d,— „	10,	$\alpha = 35\ 15\ 10$,	$\delta = +89\ \ 2\ 48.0$.

The position of these stars with reference to Polaris is shown on the accompanying diagram, which also exhibits the position and eccentricity of the parallactic ellipse.



The expressions from which the factors of parallax have been computed are, in the case of these four stars, respectively—

$$\text{For } a, \ldots\ldots\ ds = R\,[9.96123]\cos(\odot - 82^\circ\ 39')$$
$$\text{,, } b, \ldots\ldots\ ds = R\,[9.96413]\cos(\odot - 284\ \ \ 1)$$
$$\text{,, } c, \ldots\ldots\ ds = R\,[9.99906]\cos(\odot - 168\ \ 26)$$
$$\text{,, } d, \ldots\ldots\ ds = R\,[9.99824]\cos(\odot - 345\ \ 17).$$

The proper motion of Polaris in Declination has been assumed to be zero; that in Right Ascension has been taken to be $+0^s.1304$. This is the quantity given by Prof. Newcomb in his 'Standard Stars.'

Before proceeding to give the tabular results, from which the final relative parallaxes of Polaris are obtained, it is desirable to mention, that the same condensation of form is here observed as that which is adopted in the case of μ Cassiopeiæ, and for the same reason. This same condensed form of tabular work will also be found, in respect of all the other stars, discussed in the sequel of these investigations.

TABLE I.

Measures of the diagonal distances of (a) *to* (b) *and of* (c) *to* (d) *for the determination, at the times of exposure, of the correction to their measured distances from Polaris.*

No. for Reference.	Date of Exposure of Plate. 1887.			Measured Distance of (a) to (b) in Arc.	Sum of Corrections for Refraction and Aberration.	Difference from Assumed Mean 2306″.980.	Measured Distance of (c) to (d) in Arc.	Sum of Corrections for Refraction and Aberration.	Difference from Assumed Mean 2815″.870.
		d.	h.	″	″	″	″	″	″
1	Jan.	31	7.5	2305.732	+0.814	+0.434	2814.978	+0.751	+0.141
2	Feb.	1	8.5	5.716	.911	+ .353	14.693	.708	+ .469
3		8	8.7	5.966	.943	+ .071	14.909	.709	+ .252
4		15	8.1	6.095	0.929	− .044	15.032	.699	+ .139
5	July	31	10.0	6.185	1.000	− .205	15.230	0.904	− .264
6	Aug.	1	11.4	2306.275	+1.018	−0.313	2814.554	+1.003	+0.313
7		3	11.7	6.030	1.031	− .080	14.334	1.102	+ .434
8		4	12.2	5.940	0.982	+ .059	14.254	1.168	+ .448
9		8	11.6	5.671	1.016	+ .293	14.570	1.133	+ .167
10		25	12.1	6.328	0.783	− .131	14.667	1.336	− .133
11	Sept.	7	10.8	2305.866	+0.920	+0.194	2814.323	+1.278	+0.269
12		8	11.2	6.374	.868	− .262	14.049	1.316	+ .505
13		12	11.5	6.580	.822	− .422	14.579	1.338	− .047
14		17	12.2	6.391	.719	− .130	13.959	1.338	+ .573
15		22	9.9	6.101	.909	− .030	14.999	1.294	− .423

No. for Reference.	Date of Exposure of Plate. 1887–8.		Measured Distance of (*a*) to (*b*) in Arc.	Sum of Corrections for Refraction and Aberration.	Difference from Assumed Mean 2306″.980.	Measured Distance of (*c*) to (*d*) in Arc.	Sum of Corrections for Refraction and Aberration.	Difference from Assumed Mean 2815″.870.
	d.	h.	″	″	″	″	″	″
16	87 Sept. 24	9.5	2306.047	+0.933	0.000	2814.352	+1.273	+0.245
17	28	10.8	6.331	.797	− .148	15.129	1.344	− .603
18	Oct. 10	11.1	6.284	.742	− .046	14.812	1.313	− .250
19	11	10.0	6.370	.786	− .176	14.753	1.336	− .219
20	12	9.8	6.217	.792	− .029	14.672	1.335	− .137
21	13	11.1	2306.293	+0.731	−0.044	2814.726	+1.296	−0.152
22	14	9.0	5.998	.851	+ .131	14.745	1.314	− .189
23	15	9.5	5.758	.798	+ .424	14.785	1.331	− .246
24	17	10.3	6.145	.745	+ .090	14.494	1.326	+ .050
25	19	10.4	6.035	.734	+ .211	14.374	1.308	+ .188
26	20	9.8	2306.052	+0.757	+0.171	2814.416	+1.327	+0.127
27	21	12.0	6.453	.760	− .233	14.526	1.148	+ .196
28	24	11.3	6.369	.734	− .123	14.920	1.204	− .254
29	28	8.6	6.236	.792	− .048	15.118	1.316	− .564
30	Nov. 1	8.2	6.198	.790	− .008	14.260	1.310	+ .300
31	4	9.3	2306.542	+0.719	−0.281	2814.642	+1.290	−0.062
32	14	9.6	6.288	.703	− .011	14.635	1.208	+ .027
33	15	7.9	6.282	.739	− .041	14.477	1.294	+ .099
34	23	9.0	5.998	.689	+ .293	14.078	1.191	+ .601
35	29	9.3	6.119	.706	+ .155	14.126	1.116	+ .628
36	30	8.5	2306.458	+0.681	−0.159	2814.611	+1.178	+0.081
37	Dec. 5	7.4	6.194	.675	+ .111	14.308	1.234	+ .328
38	6	9.1	5.791	.714	+ .475	14.096	1.066	+ .708
39	15	9.6	6.371	.788	− .179	14.639	0.926	+ .305
40	16	7.5	5.740	.656	+ .584	14.100	1.149	+ .621
41	17	8.1	2306.032	+0.665	+0.283	2814.789	+1.225	−0.144
42	88 Jan. 4	8.2	6.104	.750	+ .126	14.670	0.898	+ .302
43	18	9.4	6.627	.927	− .574	15.090	0.730	+ .050
44	27	7.8	6.182	.822	− .024	15.048	0.756	+ .066
45	Feb. 2	10.2	6.894	.940	− .854	15.771	0.799	− .700
46	6	11.6	2306.669	+0.880	−0.569	2815.520	+1.006	−0.656
47	17	12.8	6.919	.674	− .613	15.152	1.196	− .478
48	Mar. 1	10.7	6.136	.802	+ .042	14.866	1.066	− .063
49	8	8.5	6.553	.931	− .504	15.520	0.841	− .491
50	14	9.1	6.460	.866	− .346	15.628	0.969	− .727
51	16	11.0	2306.496	+0.657	−0.173	2814.810	+1.186	−0.126
52	21	10.3	6.236	.704	+ .040	14.862	1.153	− .145
53	27	10.2	6.410	.706	− .136	14.810	1.163	− .103
54	Apr. 3	10.8	6.029	.593	+ .358	14.498	1.205	+ .167
55	6	12.3	6.185	.569	+ .226	14.685	1.101	+ .084

No. for Reference.	Date of Exposure of Plate. 1888.			Measured Distance of (a) to (b) in Arc.	Sum of Corrections for Refraction and Aberration.	Difference from Assumed Mean 2306″.980.	Measured Distance of (c) to (d) in Arc.	Sum of Corrections for Refraction and Aberration.	Difference from Assumed Mean 2815″.870.
		d.	h.	″	″	″	″	″	″
56	Apr.	11	9.9	2306.194	+0.625	+0.161	2814.975	+1.211	−0.316
57		14	9.8	6.214	.621	+ .145	14.485	1.217	+ .168
58		18	11.2	6.271	.574	+ .135	14.876	1.139	− .145
59		26	10.3	6.760	.580	− .360	15.181	1.180	− .491
60		30	10.8	6.443	.593	− .056	14.858	1.109	− .097
61	May	2	12.2	2306.251	+0.702	+0.027	2814.819	+0.914	+0.137
62		4	11.2	6.229	.635	+ .116	14.724	1.022	+ .124
63		8	11.5	6.275	.687	+ .018	14.676	0.950	+ .244
64		10	13.0	6.479	.854	− .353	15.398	0.771	− .299
65		12	12.1	5.960	.766	+ .254	14.966	0.839	+ .065
66		17	11.4	2306.250	+0.745	−0.015	2814.867	+0.900	+0.103
67		20	13.3	6.370	.950	− .340	15.641	.739	− .510
68		24	13.0	5.995	.961	+ .024	15.152	.746	− .028
69		25	12.5	6.185	.918	− .123	15.325	.768	− .223
70		28	12.0	6.293	.888	− .201	14.823	.792	+ .255
71		29	12.8	2306.168	+0.969	−0.157	2815.217	+0.756	−0.103
72		31	13.3	6.137	1.012	− .169	15.351	.765	− .246
73	June	7	11.0	5.523	0.872	+ .585	14.927	.831	+ .112
74		10	11.4	5.730	0.912	+ .338	14.797	.820	+ .253
75		14	12.3	6.488	1.027	− .535	15.466	.786	− .382
76		17	12.0	2305.468	+1.027	+0.485	2814.816	+0.792	+0.262
77		22	11.2	5.990	1.005	− .015	14.759	.797	+ .314
78	July	1	11.3	5.670	1.056	+ .254	14.693	.825	+ .352
79		3	11.9	5.190	1.076	+ .714	14.670	.865	+ .335
80		5	12.5	5.523	1.063	+ .394	15.126	.925	− .181
81		9	10.8	2305.402	+1.072	+0.506	2814.585	+0.937	+0.348
82		12	11.4	5.597	1.087	+ .296	15.182	.876	− .188
83		17	10.6	6.003	1.092	− .115	14.628	.861	+ .381
84		20	11.5	6.029	1.083	− .132	14.416	0.956	+ .498
85		23	12.2	6.085	1.027	− .132	14.330	1.073	+ .467
86		26	11.1	2306.015	+1.091	−0.126	2814.475	+0.965	+0.430

NOTES.

No. 3. Image of (d) faint: not measured on one of the plates.
No. 7. One plate rejected: the film was found to be injured.
No. 11. The exposure was continued for eight minutes, on account of fog.
No. 13. Images elongated and diffused, but measurable.
No. 16. Instrument imperfectly driven.
No. 17. The image of (d) was too faintly impressed on one plate to be measurable.

No. 22. One of the plates rejected owing to discordant measures: the cause could not be discovered.
No. 23. Images of (*d*) on two of the plates were too faint to be measured.
No. 27. One of the plates rejected through injury to the film.
No. 32. Only three plates were taken.
No. 34. Clouds passing: exposures of variable length.
No. 37. Plates somewhat fogged.
No. 42. Images faint and diffused.
No. 45. Images ill-defined.
No. 49. One of the plates rejected. The measures of one of the diagonals were discordant.
No. 53. Images elongated, but measurable.
No. 60. One of the plates rejected from injury to film.
No. 66. Exposure continued for eight minutes on account of haze.
No. 73. Images faint, but measurable.
No. 75. The image of (*d*) faint, and not measurable on one of the plates.
No. 82. One of the plates rejected from injury to film.
No. 85. Images feeble and diffused.

TABLE II.

Concluded measures of Polaris from the Stars of comparison (a) *and* (b).

No. for Reference.	Date of Exposure of Plate. 1887.			Measured Distance of Star (*a*) to Polaris.	Sum of Corrections.	Concluded Distance of Star (*a*) from Polaris.	Measured Distance of Star (*b*) to Polaris.	Sum of Corrections.	Concluded Distance of Star (*b*) from Polaris.
		d.	h.	″	″	″	″	″	″
1	Jan.	31	7.5	1284.128	+0.786	1284.914	1055.800	+0.513	1056.313
2	Feb.	1	8.5	84.214	.779	84.993	55.740	.522	56.262
3		8	8.7	84.387	.619	85.006	55.874	.411	56.285
4		15	8.1	84.422	.550	84.972	56.014	.352	56.366
5	July	31	10.0	84.762	.427	85.189	55.739	.353	56.092
6	Aug.	1	11.4	1284.752	+0.378	1285.130	1055.788	+0.327	1056.115
7		3	11.7	84.678	.582	85.260	55.494	.490	55.984
8		4	12.2	84.459	.470	84.929	55.604	.404	56.008
9		8	11.6	84.822	.363	85.185	55.923	.314	56.237
10		25	12.1	84.526	.498	85.024	55.981	.281	56.262
11	Sept.	7	10.8	1284.587	+0.362	1284.949	1055.964	+0.321	1056.285
12		8	11.2	84.340	.595	84.935	55.604	.504	56.108
13		12	11.5	84.583	.661	85.244	55.658	.550	56.208
14		17	12.2	84.580	.499	85.079	55.779	.387	56.166
15		22	9.9	84.490	.480	84.970	55.711	.421	56.132
16		24	9.5	1284.748	+0.474	1285.222	1055.884	+0.419	1056.303
17		28	10.8	84.757	.509	85.266	55.677	.421	56.098
18	Oct.	10	11.1	84.482	.451	84.933	55.916	.346	56.262
19		11	10.0	84.428	.517	84.945	55.757	.428	56.185
20		12	9.8	84.512	.404	84.916	55.932	.339	56.271

No. for Reference.	Date of Exposure of Plate. 1887–8.	Measured Distance of Star (*a*) to Polaris.	Sum of Corrections.	Concluded Distance of Star (*a*) from Polaris.	Measured Distance of Star (*b*) to Polaris.	Sum of Corrections.	Concluded Distance of Star (*b*) from Polaris.
	d. h.	″	″	″	″	″	″
21	87 Oct. 13 11.1	1284.534	+0.455	1284.989	1055.916	+0.328	1056.244
22	14 9.0	84.694	.363	85.057	55.810	.324	56.134
23	15 9.5	84.886	.184	85.070	56.010	.166	56.176
24	17 10.3	84.794	.391	85.185	55.891	.290	56.181
25	19 10.4	84.632	.301	84.933	55.931	.230	56.161
26	20 9.8	1284.471	+0.509	1284.980	1055.731	+0.414	1056.145
27	21 12.0	84.635	.353	84.988	55.937	.228	56.165
28	24 11.3	84.909	.389	85.298	56.041	.265	56.306
29	28 8.6	84.689	.387	85.076	55.928	.335	56.263
30	Nov. 1 8.2	84.872	.409	85.281	56.003	.357	56.360
31	4 9.3	1284.694	+0.252	1284.946	1056.049	+0.194	1056.243
32	14 9.6	84.667	.407	85.074	55.837	.301	56.138
33	15 7.9	84.697	.384	85.081	55.682	.326	56.008
34	23 9.0	84.366	.567	84.933	55.856	.428	56.284
35	29 9.3	84.406	.522	84.928	56.004	.379	56.383
36	30 8.5	1284.704	+0.304	1285.008	1055.099	+0.217	1056.316
37	Dec. 5 7.4	84.690	.421	85.111	56.001	.338	56.339
38	6 9.1	84.267	.715	84.982	55.573	.630	56.203
39	15 9.6	84.585	.440	85.025	56.022	.301	56.323
40	16 7.5	84.279	.688	84.967	55.779	.530	56.309
41	17 8.1	1284.642	+0.494	1285.136	1055.984	+0.411	1056.395
42	88 Jan. 4 8.2	84.355	.564	84.919	56.046	.409	56.455
43	18 9.4	84.897	.337	85.234	55.957	.256	56.213
44	27 7.8	84.445	.549	84.994	55.828	.409	56.237
45	Feb. 2 10.2	84.863	.159	85.022	56.017	.161	56.178
46	6 11.6	1285.016	+0.101	1285.117	1056.125	+0.155	1056.280
47	17 12.8	85.015	− .023	84.992	56.107	.044	56.151
48	Mar. 1 10.7	84.637	+ .394	85.031	55.730	.402	56.132
49	8 8.5	84.793	.179	84.972	56.037	.211	56.248
50	14 9.1	84.852	.211	85.063	56.131	.257	56.388
51	16 11.0	1285.001	+0.211	1285.212	1055.936	+0.241	1056.177
52	21 10.3	84.675	.333	85.008	55.890	.358	56.248
53	27 10.2	84.827	.249	86.076	55.776	.284	56.060
54	Apr. 3 10.8	84.639	.498	85.137	55.755	.453	56.208
55	6 12.3	84.677	.467	85.144	55.716	.376	56.092
56	11 9.9	1284.751	+0.393	1285.144	1055.747	+0.380	1056.127
57	14 9.8	85.006	.383	85.389	55.803	.371	56.174
58	18 11.2	84.512	.412	84.924	55.832	.340	56.172
59	26 10.3	84.979	.122	85.101	56.017	.123	56.140
60	30 10.8	84.729	.325	85.054	55.881	.263	56.144

No. for Reference.	Date of Exposure of Plate. 1888.			Measured Distance of Star (*a*) to Polaris.	Sum of Corrections.	Concluded Distance of Star (*a*) from Polaris.	Measured Distance of Star (*b*) to Polaris.	Sum of Corrections.	Concluded Distance of Star (*b*) from Polaris.
		d.	h.	"	"	"	"	"	"
61	May	2	12.2	1284.617	+0.459	1285.076	1055.890	+0.346	1056.236
62		4	11.2	84.686	.463	85.149	55.776	.359	56.135
63		8	11.5	84.712	.443	85.155	55.778	.336	56.114
64		10	13.0	84.959	.330	85.289	55.842	.247	56.089
65		12	12.1	84.302	.622	84.924	55.626	.482	56.108
66		17	11.4	1284.755	+0.458	1285.213	1055.795	+0.350	1056.145
67		20	13.3	84.892	.357	85.249	55.947	.300	56.247
68		24	13.0	84.574	.562	85.136	55.715	.469	56.184
69		25	12.5	84.605	.471	85.076	55.871	.384	56.255
70		28	12.0	84.737	.422	85.159	55.822	.337	56.159
71		29	12.8	1284.730	+0.466	1285.196	1055.709	+0.391	1056.100
72		31	13.3	84.557	.457	85.014	55.766	.408	56.174
73	June	7	11.0	84.272	.853	85.125	55.531	.681	56.212
74		10	11.4	84.255	.731	84.986	55.525	.588	56.113
75		14	12.3	84.808	.265	85.073	55.887	.252	56.139
76		17	12.0	1284.203	+0.832	1285.035	1055.472	+0.713	1056.185
77		22	11.2	84.588	.563	85.151	55.663	.475	56.138
78	July	1	11.3	84.446	.712	85.158	55.330	.624	55.954
79		3	11.9	84.220	.956	85.176	55.386	.843	56.229
80		5	12.5	84.188	.747	84.935	55.437	.697	56.134
81		9	10.8	1284.264	+0.859	1285.123	1055.386	+0.746	1056.132
82		12	11.4	84.386	.725	85.111	55.538	.661	56.199
83		17	10.6	84.850	.515	85.365	55.745	.473	56.218
84		20	11.5	84.591	.463	85.054	55.646	.471	56.117
85		23	12.2	84.656	.413	85.069	55.612	.449	56.061
86		26	11.1	1284.786	+0.469	1285.255	1055.824	+0.476	1056.300

TABLE III.

Equations of Condition formed from the concluded distances of Polaris from Star (a), *as given in Table II.*

No.	Date, 1887.			Equations of Condition.	Residuals.
		d.	h.	"	"
1	Jan.	31	7.5	$+0.114 = x - 0.5912\,\pi - 0.9168\,d\mu$	+0.127
2	Feb.	1	8.5	$+\ .193 = x -\ .5786 \quad -\ .9140$	+ .049
3		8	8.7	$+\ .206 = x -\ .4894 \quad -\ .8949$	+ .043
4		15	8.1	$+\ .172 = x -\ .3932 \quad -\ .8757$	+ .065
5	July	31	10.0	$+\ .389 = x +\ .6475 \quad -\ .4209$	− .054

No.	Date, 1887–8.		Equations of Condition.	Residuals.
		d. h.	″	″
6	87 Aug.	1 11.4	$+0.330 = x + 0.6242\,\pi - 0.4154\,d\mu$	+0.003
7		3 11.7	$+\ .460 = x + .6135 - .4127$	− .128
8		4 12.2	$+\ .129 = x + .6013 - .4099$	+ .202
9		8 11.6	$+\ .385 = x + .5530 - .3991$	− .058
10		25 12.1	$+\ .224 = x + .3195 - .3525$	+ .103
11	Sept.	7 10.8	$+0.149 = x + 0.1234 - 0.3170$	+0.141
12		8 11.2	$+\ .135 = x + .1077 - .3142$	+ .153
13		12 11.5	$+\ .444 = x + .0449 - .3032$	+ .139
14		17 12.2	$+\ .279 = x - .0337 - .2897$	− .003
15		22 9.9	$+\ .170 = x - .1102 - .2760$	+ .100
16		24 9.5	$+0.422 = x - 0.1411 - 0.2705$	−0.155
17		28 10.8	$+\ .466 = x - .2031 - .2595$	− .204
18	Oct.	10 11.1	$+\ .133 = x - .3809 - .2266$	+ .113
19		11 10.0	$+\ .145 = x - .3944 - .2240$	+ .100
20		12 9.8	$+\ .116 = x - .4083 - .2212$	+ .128
21		13 11.1	$+0.189 = x - 0.4229 - 0.2184$	+0.054
22		14 9.0	$+\ .257 = x - .4357 - .2157$	− .016
23		15 9.5	$+\ .270 = x - .4496 - .2131$	− .030
24		17 10.3	$+\ .385 = x - .4770 - .2075$	− .148
25		19 10.4	$+\ .133 = x - .5034 - .2021$	+ .102
26		20 9.8	$+0.180 = x - 0.5158 - 0.1993$	+0.054
27		21 12.0	$+\ .188 = x - .5300 - .1966$	+ .045
28		24 11.3	$+\ .498 = x - .5669 - .1883$	− .269
29		28 8.6	$+\ .276 = x - .6131 - .1774$	− .050
30	Nov.	1 8.2	$+\ .481 = x - .6574 - .1667$	− .259
31		4 9.3	$+0.146 = x - 0.6895 - 0.1584$	+0.073
32		14 9.6	$+\ .274 = x - .7798 - .1310$	− .062
33		15 7.9	$+\ .281 = x - .7871 - .1284$	− .071
34		23 9.0	$+\ .133 = x - .8406 - .1064$	+ .073
35		29 9.3	$+\ .128 = x - .8698 - .0899$	+ .075
36		30 8.5	$+0.208 = x - 0.8736 - 0.0873$	−0.006
37	Dec.	5 7.4	$+\ .311 = x - .8890 - .0737$	− .110
38		6 9.1	$+\ .182 = x - .8917 - .0708$	+ .019
39		15 9.6	$+\ .225 = x - .8997 - .0462$	− .025
40		16 7.5	$+\ .167 = x - .8995 - .0436$	+ .033
41		17 8.1	$+0.336 = x - 0.8985 - 0.0408$	−0.136
42	88 Jan.	4 8.2	$+\ .119 = x - .8435 + .0092$	+ .085
43		18 9.4	$+\ .434 = x - .7315 + .0477$	− .222
44		27 7.8	$+\ .194 = x - .6337 + .0721$	+ .026
45	Feb.	2 10.2	$+\ .222 = x - .5685 + .0888$	+ .005

No.	Date, 1888.		Equations of Condition.	Residuals.
		d. h.		″
46	Feb.	6 11.6	$+0.317 = x - 0.5170\,\pi + 0.0999\,d\mu$	−0.089
47		17 12.8	$+ .192 = x - .3648 + .1301$	+ .050
48	Mar.	1 10.7	$+ .231 = x - .1705 + .1654$	+ .026
49		8 8.5	$+ .172 = x - .0621 + .1844$	+ .094
50		14 9.1	$+ .263 = x + .0333 + .2009$	+ .011
51		16 11.0	$+0.412 = x + 0.0662 + 0.2065$	−0.136
52		21 10.3	$+ .208 = x + .1442 + .2201$	+ .074
53		27 10.2	$+ .276 = x + .2367 + .2366$	+ .014
54	Apr.	3 10.8	$+ .337 = x + .3421 + .2557$	− .039
55		6 12.3	$+ .344 = x + .3866 + .2642$	− .043
56		11 9.9	$+0.344 = x + 0.4554 + 0.2776$	−0.036
57		14 9.8	$+ .589 = x + .4960 + .2858$	− .278
58		18 11.2	$+ .124 = x + .5490 + .2970$	+ .191
59		26 10.3	$+ .301 = x + .6446 + .3187$	+ .022
60		30 10.8	$+ .254 = x + .6885 + .3297$	+ .072
61	May	2 12.2	$+0.276 = x + 0.7099 + 0.3354$	+0.051
62		4 11.2	$+ .349 = x + .7294 + .3408$	− .020
63		8 11.5	$+ .355 = x + .7668 + .3516$	− .023
64		10 13.0	$+ .489 = x + .7845 + .3574$	− .156
65		12 12.1	$+ .124 = x + .8008 + .3628$	+ .211
66		17 11.4	$+0.413 = x + 0.8374 + 0.3762$	−0.076
67		20 13.3	$+ .449 = x + .8569 + .3848$	− .110
68		24 13.0	$+ .336 = x + .8790 + .3958$	+ .005
69		25 12.5	$+ .276 = x + .8839 + .3984$	+ .065
70		28 12.0	$+ .359 = x + .9010 + .4066$	− .017
71		29 12.8	$+0.396 = x + 0.9047 + 0.4094$	−0.054
72		31 13.3	$+ .214 = x + .9085 + .4149$	+ .129
73	June	7 11.0	$+ .325 = x + .9247 + .4338$	+ .018
74		10 11.4	$+ .186 = x + .9283 + .4421$	+ .157
75		14 12.3	$+ .273 = x + .9288 + .4532$	+ .071
76		17 12.0	$+0.235 = x + 0.9266 + 0.4614$	+0.109
77		22 11.2	$+ .351 = x + .9177 + .4750$	− .008
78	July	1 11.3	$+ .358 = x + .8853 + .4996$	− .019
79		3 11.9	$+ .376 = x + .8752 + .5051$	− .038
80		5 12.5	$+ .135 = x + .8642 + .5107$	+ .202
81		9 10.8	$+0.323 = x + 0.8400 + 0.5215$	+0.012
82		12 11.4	$+ .311 = x + .8186 + .5297$	+ .023
83		17 10.6	$+ .565 = x + .7793 + .5434$	− .236
84		20 11.5	$+ .254 = x + .7523 + .5516$	+ .073
85		23 12.2	$+ .269 = x + .7236 + .5599$	+ .055
86		26 11.1	$+0.455 = x + 0.6939 + 0.5681$	−0.133

Treating these equations in the usual method, the following normal equations result:—

$$\begin{aligned} +24''.094 &= +86.0000\,x + 3.6042\,d\mu + 7.3926\,\pi \\ +1.888 &= +3.6042 \quad +11.6258 \quad +13.2181 \\ +4.899 &= +7.3926 \quad +13.2181 \quad +37.1257 \end{aligned}$$

whence, by solution, are obtained the values of the unknowns, viz.—

$$\begin{aligned} x &= +0''.274 \\ d\mu &= -0.018 \\ \pi &= +0.0837. \end{aligned}$$

It further appears that the probable error of one complete measure of distance is $\pm 0''.109$, and that the probable error of the determination of π is $\pm 0''.0232$.

TABLE IV.

Equations of Condition formed from the concluded distances of Polaris from Star (b), *as given in Table II.*

No.	Date, 1887.			Equations of Condition.					Residuals.
		d.	h.	$''$					$''$
1	Jan.	31	7.5	+0.313	=	x	+0.8037 π	−0.9168 $d\mu$	−0.044
2	Feb.	1	8.5	+ .262	=	x	+ .7985	− .9140	+ .007
3		8	8.7	+ .285	=	x	+ .7369	− .8949	− .020
4		15	8.1	+ .366	=	x	+ .6671	− .8757	− .107
5	July	31	10.0	+ .092	=	x	− .8509	− .4209	+ .048
6	Aug.	1	11.4	+0.115	=	x	−0.8372	−0.4154	+0.026
7		3	11.7	− .016	=	x	− .8304	− .4127	+ .155
8		4	12.2	+ .008	=	x	− .8228	− .4099	+ .134
9		8	11.6	+ .237	=	x	− .7912	− .3991	− .093
10		25	12.1	+ .262	=	x	− .6216	− .3525	− .106
11	Sept.	7	10.8	+0.285	=	x	−0.4505	−0.3170	−0.114
12		8	11.2	+ .108	=	x	− .4364	− .3142	+ .064
13		12	11.5	+ .208	=	x	− .3791	− .3032	− .032
14		17	12.2	+ .166	=	x	− .3051	− .2897	+ .016
15		22	9.9	+ .132	=	x	− .2307	− .2760	+ .036
16		24	9.5	+0.303	=	x	−0.2001	−0.2705	−0.133
17		28	10.8	+ .098	=	x	− .1370	− .2595	+ .097
18	Oct.	10	11.1	+ .262	=	x	+ .0529	− .2266	− .052
19		11	10.0	+ .185	=	x	+ .0681	− .2240	+ .026
20		12	9.8	+ .271	=	x	+ .0838	− .2212	− .058

No.	Date, 1887–8.			Equations of Condition.	Residuals.
		d.	h.	″	″
21	87 Oct.	13	11.1	$+0.244 = x + 0.1002\,\pi - 0.2184\,d\mu$	−0.030
22		14	9.0	$+ .134 = x + .1148 - .2157$	+ .081
23		15	9.5	$+ .176 = x + .1308 - .2131$	+ .039
24		17	10.3	$+ .181 = x + .1629 - .2075$	+ .036
25		19	10.4	$+ .161 = x + .1937 - .2021$	+ .059
26		20	9.8	$+0.145 = x + 0.2086 - 0.1993$	+0.076
27		21	12.0	$+ .165 = x + .2257 - .1966$	+ .058
28		24	11.3	$+ .306 = x + .2709 - .1883$	− .080
29		28	8.6	$+ .263 = x + .3291 - .1774$	− .032
30	Nov.	1	8.2	$+ .360 = x + .3871 - .1667$	− .125
31		4	9.3	$+0.243 = x + 0.4304 - 0.1584$	−0.004
32		14	9.6	$+ .138 = x + .5631 - .1310$	+ .111
33		15	7.9	$+ .008 = x + .5746 - .1284$	+ .241
34		23	9.0	$+ .284 = x + .6676 - .1064$	− .027
35		29	9.3	$+ .383 = x + .7283 - .0899$	− .121
36		30	8.5	$+0.316 = x + 0.7374 - 0.0873$	−0.053
37	Dec.	5	7.4	$+ .339 = x + .7802 - .0737$	− .073
38		6	9.1	$+ .203 = x + .7890 - .0708$	+ .064
39		15	9.6	$+ .323 = x + .8494 - .0462$	− .052
40		16	7.5	$+ .309 = x + .8543 - .0436$	− .038
41		17	8.1	$+0.395 = x + 0.8596 - 0.0408$	−0.123
42	88 Jan.	4	8.2	$+ .455 = x + .9051 + .0092$	− .180
43		18	9.4	$+ .213 = x + .8780 + .0477$	+ .061
44		27	7.8	$+ .237 = x + .8325 + .0721$	+ .033
45	Feb.	2	10.2	$+ .178 = x + .7896 + .0888$	+ .089
46		6	11.6	$+0.280 = x + 0.7473 + 0.0999$	−0.017
47		17	12.8	$+ .151 = x + .6454 + .1301$	+ .105
48	Mar.	1	10.7	$+ .132 = x + .4864 + .1654$	+ .111
49		8	8.5	$+ .248 = x + .3907 + .1844$	− .013
50		14	9.1	$+ .388 = x + .3023 + .2009$	− .160
51		16	11.0	$+0.177 = x + 0.2711 + 0.2065$	+0.048
52		21	10.3	$+ .248 = x + .1950 + .2201$	− .029
53		27	10.2	$+ .060 = x + .1017 + .2366$	+ .152
54	Apr.	3	10.8	$+ .208 = x - .0094 + .2557$	− .005
55		6	12.3	$+ .092 = x - .0579 + .2642$	+ .107
56		11	9.9	$+0.127 = x - 0.1349 + 0.2776$	+0.067
57		14	9.8	$+ .174 = x - .1816 + .2858$	+ .016
58		18	11.2	$+ .172 = x - .2442 + .2970$	+ .013
59		26	10.3	$+ .140 = x - .3631 + .3187$	+ .036
60		30	10.8	$+ .144 = x - .4206 + .3297$	+ .027

No.	Date, 1888.			Equations of Condition.	Residuals.
		d.	h.	″	″
61	May	2	12.2	$+0.236 = x - 0.4495\,\pi + 0.3354\,d\mu$	−0.067
62		4	11.2	$+\ .135 = x -\ .4764 +\ .3408$	+ .032
63		8	11.5	$+\ .114 = x -\ .5299 +\ .3516$	+ .049
64		10	13.0	$+\ .089 = x -\ .5563 +\ .3574$	+ .071
65		12	12.1	$+\ .108 = x -\ .5810 +\ .3628$	+ .051
66		17	11.4	$+0.145 = x - 0.6402 + 0.3762$	+0.009
67		20	13.3	$+\ .247 = x -\ .6747 +\ .3848$	− .093
68		24	13.0	$+\ .184 = x -\ .7166 +\ .3958$	− .036
69		25	12.5	$+\ .255 = x -\ .7264 +\ .3984$	− .108
70		28	12.0	$+\ .159 = x -\ .7642 +\ .4066$	− .014
71		29	12.8	$+0.100 = x - 0.7734 + 0.4094$	+0.044
72		31	13.3	$+\ .174 = x -\ .7826 +\ .4149$	− .031
73	June	7	11.0	$+\ .212 = x -\ .8366 +\ .4338$	− .074
74		10	11.4	$+\ .113 = x -\ .8570 +\ .4421$	+ .024
75		14	12.3	$+\ .139 = x -\ .8804 +\ .4532$	− .004
76		17	12.0	$+0.185 = x - 0.8953 + 0.4614$	−0.051
77		22	11.2	$+\ .138 = x -\ .9149 +\ .4750$	− .005
78	July	1	11.3	$-\ .046 = x -\ .9344 +\ .4996$	+ .177
79		3	11.9	$+\ .229 = x -\ .9356 +\ .5051$	− .098
80		5	12.5	$+\ .134 = x -\ .9360 +\ .5107$	− .003
81		9	10.8	$+0.132 = x - 0.9337 + 0.5215$	−0.001
82		12	11.4	$+\ .199 = x -\ .9290 +\ .5297$	− .068
83		17	10.6	$+\ .218 = x -\ .9164 +\ .5434$	− .085
84		20	11.5	$+\ .117 = x -\ .9053 +\ .5516$	+ .016
85		23	12.2	$+\ .061 = x -\ .8919 +\ .5599$	+ .074
86		26	11.1	$+0.300 = x - 0.8768 + 0.5681$	−0.164

Treating these equations in the usual method, the following normal equations result:—

$$
\begin{array}{rcllll}
+16''.921 & = & +86.0000\,x & +\ 3.6042\,d\mu & -\ 9.0054\,\pi \\
-\ 0.093 & = & +\ 3.6042 & +11.6258 & -10.3180 \\
+\ 0.872 & = & -\ 9.0054 & -10.3180 & +34.5320
\end{array}
$$

whence, by solution, are obtained the values of the unknowns, viz.—

$$x = +0''.205$$
$$d\mu = -0.0023$$
$$\pi = +0.0780.$$

It further appears that the probable error of one complete measure of distance is $\pm 0''.084$, and that the probable error of π is $\pm 0''.0169$.

PARALLAX OF POLARIS RELATIVELY TO STARS (C) *AND* (D).

TABLE V.

Concluded measures of Polaris from the Stars of comparison (c) *and* (d).

No. for Reference.	Date of Exposure of Plate. 1887.			Measured Distance of Star (c) to Polaris.	Sum of Corrections.	Concluded Distance of Star (c) from Polaris.	Measured Distance of Star (d) to Polaris.	Sum of Corrections.	Concluded Distance of Star (d) from Polaris.
		d.	h.	"	"	"	"	"	"
1	Jan.	31	7.5	1181.633	+ 0.401	1182.034	1634.014	+ 0.474	1634.488
2	Feb.	1	8.5	81.503	.524	82.027	33.952	.653	34.605
3		8	8.7	81.697	.437	82.134	33.972	.540	34.512
4		15	8.1	81.672	.384	82.056	34.069	.468	34.537
5	July	31	10.0	81.806	.331	82.137	33.848	.514	34.362
6	Aug.	1	11.4	1181.587	+ 0.615	1182.202	1633.563	+ 0.840	1634.403
7		3	11.7	81.588	.672	82.260	33.491	.907	34.398
8		4	12.2	81.528	.704	82.232	33.312	.956	34.268
9		8	11.6	81.586	.571	82.157	33.430	.770	34.200
10		25	12.1	81.734	.521	82.255	33.525	.685	34.210
11	Sept.	7	10.8	1181.571	+ 0.669	1182.240	1633.586	+ 0.905	1634.491
12		8	11.2	81.297	.784	82.081	33.249	1.071	34.320
13		12	11.5	81.625	.558	82.183	33.472	0.746	34.218
14		17	12.2	81.456	.812	82.268	33.332	1.090	34.422
15		22	9.9	81.772	.385	82.157	33.820	0.512	34.332
16		24	9.5	1181.656	+ 0.658	1182.314	1633.253	+ 0.904	1634.157
17		28	10.8	81.722	.325	82.047	33.964	.425	34.389
18	Oct.	10	11.1	81.793	.451	82.244	33.728	.594	34.322
19		11	10.0	81.672	.481	82.153	33.719	.642	34.361
20		12	9.8	81.717	.517	82.234	33.585	.691	34.276
21		13	11.1	1181.735	+ 0.486	1182.221	1633.893	+ 0.642	1634.535
22		14	9.0	81.766	.488	82.254	33.668	.657	34.325
23		15	9.5	81.830	.469	82.299	33.856	.629	34.484
24		17	10.3	81.530	.583	82.113	33.478	.780	34.258
25		19	10.4	81.402	.635	82.037	33.676	.852	34.528
26		20	9.8	1181.544	+ 0.619	1182.163	1633.525	+ 0.735	1634.260
27		21	12.0	81.551	.565	82.116	33.598	.747	34.345
28		24	11.3	81.634	.402	82.036	33.897	.518	34.415
29		28	8.6	81.905	.329	82.234	33.984	.436	34.420
30	Nov.	1	8.2	81.447	.689	82.136	33.642	.936	34.578

No. for Reference.	Date of Exposure of Plate. 1887–8.	d.	h.	Measured Distance of Star (c) to Polaris.	Sum of Corrections.	Concluded Distance of Star (c) from Polaris.	Measured Distance of Star (d) to Polaris.	Sum of Corrections.	Concluded Distance of Star (d) from Polaris.
		d.	h.	"	"	"	"	"	"
31	87 Nov.	4	9.3	1181.707	+0.521	1182.228	1633.787	+0.697	1634.484
32		14	9.6	81.683	.518	82.201	33.750	0.691	34.441
33		15	7.9	81.578	.593	82.171	33.672	0.804	34.476
34		23	9.0	81.313	.753	82.066	33.402	1.014	34.416
35		29	9.3	81.348	.732	82.080	33.344	0.983	34.327
36		30	8.5	1181.573	+0.530	1182.103	1633.717	+0.706	1634.423
37	Dec.	5	7.4	81.446	.658	82.104	33.465	0.894	34.359
38		6	9.1	81.366	.743	82.109	33.418	1.002	34.420
39		15	9.6	81.765	.514	82.279	33.748	0.692	34.440
40		16	7.5	81.516	.741	82.257	33.484	1.004	34.488
41		17	8.1	1181.654	+0.458	1182.112	1633.918	+0.616	1634.534
42	88 Jan.	4	8.2	81.625	.498	82.123	33.740	.670	34.410
43		18	9.4	81.779	.330	82.109	33.966	.458	34.424
44		27	7.8	81.921	.341	82.262	33.892	.465	34.357
45	Feb.	2	10.2	82.081	.049	82.130	33.255	.084	34.339
46		6	11.6	1181.894	+0.156	1182.050	1634.312	+0.235	1634.547
47		17	12.8	81.858	.303	82.161	34.034	.426	34.460
48	Mar.	1	10.7	81.632	.428	82.060	34.112	.610	34.722
49		8	8.5	81.933	.154	82.087	34.444	.237	34.681
50		14	9.1	81.984	.109	82.093	34.415	.075	34.490
51		16	11.0	1181.671	+0.444	1182.115	1634.113	+0.625	1634.738
52		21	10.3	81.673	.424	82.097	34.134	.603	34.737
53		27	10.2	81.593	.444	82.037	33.904	.580	34.484
54	Apr.	3	10.8	81.370	.570	81.940	33.708	.797	34.505
55		6	12.3	81.632	.484	82.116	33.813	.673	34.486
56		11	9.9	1181.686	+0.373	1182.059	1634.140	+0.527	1634.667
57		14	9.8	81.555	.577	82.132	33.751	.719	34.470
58		18	11.2	81.630	.404	82.034	33.860	.561	34.421
59		26	10.3	81.897	.277	82.174	34.060	.387	34.447
60		30	10.8	81.720	.410	82.130	33.800	.569	34.369
61	May	2	12.2	1181.673	+0.426	1182.099	1633.942	+0.433	1634.375
62		4	11.2	81.521	.465	81.986	33.746	.645	34.391
63		8	11.5	81.553	.484	82.037	33.704	.675	34.379
64		10	13.0	81.753	.187	81.940	34.012	.324	34.336
65		12	12.1	81.754	.370	82.124	33.869	.520	34.389
66		17	11.4	1181.754	+0.405	1182.159	1633.980	−0.563	1634.543
67		20	13.3	82.033	.099	82.132	34.229	.146	34.375
68		24	13.0	81.834	.292	82.126	34.113	.421	34.534
69		25	12.5	81.776	.218	81.994	34.028	.320	34.348
70		28	12.0	81.606	.424	82.030	33.863	.608	34.471

No. for Reference.	Date of Exposure of Plate. 1888.			Measured Distance of Star (*c*) to Polaris.	Sum of Corrections.	Concluded Distance of Star (*c*) from Polaris.	Measured Distance of Star (*d*) to Polaris.	Sum of Corrections.	Concluded Distance of Star (*d*) from Polaris.
		d.	h.	"	"	"	"	"	"
71	May	29	12.8	1181.813	+0.266	1182.079	1633.993	+0.393	1634.386
72		31	13.3	81.913	.212	82.125	34.119	.326	34.445
73	June	7	11.0	81.678	.380	82.058	33.817	.544	34.361
74		10	11.4	81.695	.436	82.131	33.827	.624	34.451
75		14	12.3	81.894	.162	82.056	34.145	.261	34.406
76		17	12.0	1181.683	+0.434	1182.117	1633.739	+0.634	1634.373
77		22	11.2	81.648	.456	82.104	33.704	.662	34.366
78	July	1	11.3	81.623	.486	82.109	33.885	.510	34.395
79		3	11.9	81.637	.499	82.136	33.613	.734	34.347
80		5	12.5	81.781	.462	82.243	33.585	.688	34.273
81		9	10.8	1181.579	+0.489	1182.068	1634.077	+0.418	1634.495
82		12	11.4	81.856	.284	82.140	33.606	.718	34.324
83		17	10.6	81.592	.511	82.103	33.526	.755	34.281
84		20	11.5	81.597	.603	82.200	33.568	.889	34.457
85		23	12.2	81.539	.641	82.180	33.662	.742	34.404
86		26	11.1	1181.530	+0.579	1182.109	1634.051	+0.356	1634.407

TABLE VI.

Equations of Condition formed from the concluded distances of Polaris from Star (c), *as given in Table V.*

No.	Date, 1887.			Equations of Condition.	Residuals.
		d.	h.	"	"
1	Jan.	31	7.5	$+0.034 = x - 0.7880\,\pi - 0.9168\,d\mu$	+0.074
2	Feb.	1	8.5	$+\ .027 = x -\ .7986 \quad -\ .9140$	+ .079
3		8	8.7	$+\ .134 = x -\ .8644 \quad -\ .8949$	− .031
4		15	8.1	$+\ .056 = x -\ .9173 \quad -\ .8757$	+ .049
5	July	31	10.0	$+\ .137 = x +\ .7757 \quad -\ .4209$	− .040
6	Aug.	1	11.4	$+0.202 = x + 0.7969 \quad - 0.4154$	−0.024
7		3	11.7	$+\ .260 = x +\ .8065 \quad -\ .4127$	− .081
8		4	12.2	$+\ .232 = x +\ .8168 \quad -\ .4099$	− .052
9		8	11.6	$+\ .157 = x +\ .8541 \quad -\ .3991$	+ .024
10		25	12.1	$+\ .255 = x +\ .9690 \quad -\ .3525$	− .068

No.	Date, 1887–8.			Equations of Condition.	Residuals.
		d.	h.	″	″
11	87 Sept.	7	10.8	$+0.240 = x + 1.0033\,\pi - 0.3170\,d\mu$	−0.053
12		8	11.2	$+\ .081 = x + 1.0040 - .3142$	+ .106
13		12	11.5	$+\ .183 = x + 1.0035 - .3032$	+ .004
14		17	12.2	$+\ .268 = x + 0.9963 - .2897$	− .081
15		22	9.9	$+\ .157 = x + 0.9822 - .2760$	+ .028
16		24	9.5	$+0.314 = x + 0.9732 - 0.2705$	−0.129
17		28	10.8	$+\ .047 = x + .9552 - .2595$	+ .137
18	Oct.	10	11.1	$+\ .244 = x + .8720 - .2266$	− .066
19		11	10.0	$+\ .153 = x + .8636 - .2240$	+ .025
20		12	9.8	$+\ .234 = x + .8587 - .2212$	− .056
21		13	11.1	$+0.221 = x + 0.8451 - 0.2184$	−0.044
22		14	9.0	$+\ .254 = x + .8364 - .2157$	− .078
23		15	9.5	$+\ .299 = x + .8264 - .2131$	− .123
24		17	10.3	$+\ .113 = x + .8061 - .2075$	+ .062
25		19	10.4	$+\ .037 = x + .7851 - .2021$	+ .136
26		20	9.8	$+0.163 = x + 0.7743 - 0.1993$	+0.009
27		21	12.0	$+\ .116 = x + .7621 - .1966$	+ .056
28		24	11.3	$+\ .036 = x + .7278 - .1883$	+ .134
29		28	8.6	$+\ .234 = x + .6797 - .1774$	− .067
30	Nov.	1	8.2	$+\ .136 = x + .6273 - .1667$	+ .029
31		4	9.3	$+0.228 = x + 0.5851 - 0.1584$	−0.065
32		14	9.6	$+\ .201 = x + .4356 - .1310$	− .047
33		15	7.9	$+\ .171 = x + .4211 - .1284$	− .018
34		23	9.0	$+\ .066 = x + .2901 - .1064$	+ .079
35		29	9.3	$+\ .080 = x + .1885 - .0899$	+ .059
36		30	8.5	$+0.103 = x + 0.1748 - 0.0873$	+0.036
37	Dec.	5	7.4	$+\ .104 = x + .0867 - .0737$	+ .031
38		6	9.1	$+\ .109 = x + .0677 - .0708$	+ .025
39		15	9.6	$+\ .279 = x - .0893 - .0462$	− .155
40		16	7.5	$+\ .257 = x - .1052 - .0436$	− .133
41		17	8.1	$+0.112 = x - 0.1231 - 0.0408$	+0.011
42	88 Jan.	4	8.2	$+\ .123 = x - .4072 + .0092$	− .016
43		18	9.4	$+\ .109 = x - .6292 + .0477$	− .015
44		27	7.8	$+\ .262 = x - .7413 + .0721$	− .175
45	Feb.	2	10.2	$+\ .130 = x - .8072 + .0888$	− .046
46		6	11.6	$+0.050 = x - 0.8457 + 0.0999$	+0.032
47		17	12.8	$+\ .161 = x - .9294 + .1301$	− .084
48	Mar.	1	10.7	$+\ .060 = x - .9829 + .1654$	+ .013
49		8	8.5	$+\ .087 = x - .9915 + .1844$	− .015
50		14	9.1	$+\ .093 = x - .9870 + .2009$	− .021

No.	Date, 1888.	Equations of Condition.	Residuals.
	d. h.	″	″
51	Mar. 16 11.0	$+0.115 = x - 0.9829\,\pi + 0.2065\,d\mu$	−0.044
52	21 10.3	$+ .097 = x - .9683 + .2201$	− .025
53	27 10.2	$+ .037 = x - .9410 + .2366$	+ .042
54	Apr. 3 10.8	$- .060 = x - .8962 + .2557$	+ .136
55	6 12.3	$+ .116 = x - .8728 + .2642$	− .039
56	11 9.9	$+0.059 = x - 0.8300 + 0.2776$	+0.020
57	14 9.8	$+ .132 = x - .8010 + .2858$	− .052
58	18 11.2	$+ .034 = x - .7584 + .2970$	+ .047
59	26 10.3	$+ .174 = x - .6642 + .3187$	− .087
60	30 10.8	$+ .130 = x - .6119 + .3297$	− .041
61	May 2 12.2	$+0.099 = x - 0.5837 + 0.3354$	−0.009
62	4 11.2	$- .014 = x - .5568 + .3408$	+ .105
63	8 11.5	$+ .037 = x - .4992 + .3516$	+ .057
64	10 13.0	$- .060 = x - .4686 + .3574$	+ .156
65	12 12.1	$+ .124 = x - .4391 + .3628$	− .027
66	17 11.4	$+0.159 = x - 0.3622 + 0.3762$	−0.048
67	20 13.3	$+ .132 = x - .3131 + .3848$	− .029
68	24 13.0	$+ .126 = x - .2472 + .3958$	− .020
69	25 12.5	$- .006 = x - .2324 + .3984$	+ .113
70	28 12.0	$+ .030 = x - .1664 + .4066$	+ .080
71	29 12.8	$+0.079 = x - 0.1493 + 0.4094$	+0.032
72	31 13.3	$+ .125 = x - .1321 + .4149$	− .013
73	June 7 11.0	$+ .058 = x - .0159 + .4338$	+ .059
74	10 11.4	$+ .131 = x + .0351 + .4421$	− .011
75	14 12.3	$+ .056 = x + .1034 + .4532$	+ .067
76	17 12.0	$+0.117 = x + 0.1534 + 0.4614$	+0.009
77	22 11.2	$+ .104 = x + .2357 + .4750$	+ .026
78	July 1 11.3	$+ .109 = x + .3804 + .4996$	+ .028
79	3 11.9	$+ .136 = x + .4119 + .5051$	+ .002
80	5 12.5	$+ .243 = x + .4429 + .5107$	− .103
81	9 10.8	$+0.068 = x + 0.5014 + 0.5215$	+0.074
82	12 11.4	$+ .140 = x + .5450 + .5297$	+ .004
83	17 10.6	$+ .103 = x + .6136 + .5434$	+ .045
84	20 11.5	$+ .200 = x + .6537 + .5516$	− .050
85	23 12.2	$+ .180 = x + .6917 + .5599$	− .029
86	26 11.1	$+0.109 = x + 0.7273 + 0.5681$	+0.044

Treating these equations in the usual method, the following normal equations result:—

$$
\begin{aligned}
+11''.236 &= +86.0000\,x + 3.6042\,d\mu + 6.4476\,\pi \\
-0.062 &= +3.6042 + 11.6258 - 5.0828 \\
+3.073 &= +6.4476 - 5.0828 + 41.0127
\end{aligned}
$$

whence, by solution, are obtained the values of the unknowns, viz.—

$$
\begin{aligned}
x &= +0''.128 \\
d\mu &= -0.0224 \\
\pi &- +0.0521.
\end{aligned}
$$

It further appears that the probable error of one complete measure of distance is $\pm 0''.070$, and that the probable error of the determination of π is $\pm 0''.0114$.

TABLE VII.

Equations of Condition formed from the concluded distances of Polaris from Star (d), *as given in Table V.*

No.	Date, 1887.			Equations of Condition.	Residuals.
		d.	h.	$''$	$''$
1	Jan.	31	7.5	$+0.288 = x + 0.8173\,\pi - 0.9168\,d\mu$	$+0.092$
2	Feb.	1	8.5	$+\ .405 = x +\ .8272 -\ .9140$	$-\ .025$
3		8	8.7	$+\ .312 = x +\ .8872 -\ .8949$	$+\ .072$
4		15	8.1	$+\ .337 = x +\ .9339 -\ .8757$	$+\ .051$
5	July	31	10.0	$+\ .162 = x -\ .8085 -\ .4209$	$+\ .020$
6	Aug.	1	11.4	$+0.203 = x - 0.8283 - 0.4154$	-0.024
7		3	11.7	$+\ .198 = x -\ .8371 -\ .4127$	$-\ .022$
8		4	12.2	$+\ .068 = x -\ .8466 -\ .4099$	$+\ .107$
9		8	11.6	$+\ .000 = x -\ .8808 -\ .3991$	$+\ .171$
10		25	12.1	$+\ .010 = x - 0.9809 -\ .3525$	$+\ .148$
11	Sept.	7	10.8	$+0.291 = x - 1.0030 - 0.3170$	-0.137
12		8	11.2	$+\ .120 = x - 1.0027 -\ .3142$	$+\ .033$
13		12	11.5	$+\ .018 = x - 0.9984 -\ .3032$	$+\ .135$
14		17	12.2	$+\ .222 = x -\ .9865 -\ .2897$	$-\ .070$
15		22	9.9	$+\ .132 = x -\ .9680 -\ .2760$	$+\ .021$
16		24	9.5	$-0.043 = x - 0.9587 - 0.2705$	$+0.197$
17		28	10.8	$+\ .189 = x -\ .9358 -\ .2595$	$-\ .034$
18	Oct.	10	11.1	$+\ .122 = x -\ .8426 -\ .2266$	$+\ .041$
19		11	10.0	$+\ .161 = x -\ .8333 -\ .2240$	$+\ .002$
20		12	9.8	$+\ .076 = x -\ .8236 -\ .2212$	$+\ .088$

No.	Date, 1887–8.			Equations of Condition.	Residuals.
		d.	h.	″	″
21	87 Oct.	13	11.1	$+0.335 = x - 0.8134\,\pi - 0.2184\,d\mu$	-0.170
22		14	9.0	$+ .125 = x - .8039 - .2157$	$+ .041$
23		15	9.5	$+ .284 = x - .7930 - .2131$	$- .118$
24		17	10.3	$+ .058 = x - .7713 - .2075$	$+ .110$
25		19	10.4	$+ .328 = x - .7489 - .2021$	$- .158$
26		20	9.8	$+0.060 = x - 0.7376 - 0.1993$	$+0.111$
27		21	12.0	$+ .145 = x - .7244 - .1966$	$+ .028$
28		24	11.3	$+ .215 = x - .6883 - .1883$	$- .040$
29		28	8.6	$+ .220 = x - .6378 - .1774$	$- .040$
30	Nov.	1	8.2	$+ .378 = x - .5830 - .1667$	$- .193$
31		4	9.3	$+0.284 = x - 0.5393 - 0.1584$	-0.096
32		14	9.6	$+ .241 = x - .3856 - .1310$	$- .040$
33		15	7.9	$+ .276 = x - .3707 - .1284$	$- .074$
34		23	9.0	$+ .216 = x - .2375 - .1064$	$+ .002$
35		29	9.3	$+ .127 = x - .1350 - .0899$	$+ .096$
36		30	8.5	$+0.223 = x - 0.1182 - 0.0873$	$+0.001$
37	Dec.	5	7.4	$+ .159 = x - .0325 - .0737$	$+ .073$
38		6	9.1	$+ .220 = x - .0137 - .0708$	$+ .016$
39		15	9.6	$+ .240 = x + .1426 - .0462$	$+ .007$
40		16	7.5	$+ .288 = x + .1584 - .0436$	$- .039$
41		17	8.1	$+0.334 = x + 0.1760 - 0.0408$	-0.084
42	88 Jan.	4	8.2	$+ .210 = x + .4547 + .0092$	$+ .065$
43		18	9.4	$+ .224 = x + .6683 + .0477$	$+ .069$
44		27	7.8	$+ .157 = x + .7738 + .0721$	$+ .145$
45	Feb.	2	10.2	$+ .139 = x + .8352 + .0888$	$+ .168$
46		6	11.6	$+0.347 = x + 0.8706 + 0.0999$	-0.037
47		17	12.8	$+ .260 = x + .9443 + .1301$	$+ .054$
48	Mar.	1	10.7	$+ .522 = x + .9856 + .1654$	$- .205$
49		8	8.5	$+ .481 = x + .9877 + .1844$	$- .165$
50		14	9.1	$+ .290 = x + .9772 + .2009$	$+ .023$
51		16	11.0	$+0.538 = x + 0.9714 + 0.2065$	-0.226
52		21	10.3	$+ .537 = x + .9521 + .2201$	$- .228$
53		27	10.2	$+ .284 = x + .9196 + .2366$	$+ .020$
54	Apr.	3	10.8	$+ .305 = x + .8690 + .2557$	$- .006$
55		6	12.3	$+ .286 = x + .8428 + .2642$	$+ .009$
56		11	9.9	$+0.467 = x + 0.7963 + 0.2776$	-0.177
57		14	9.8	$+ .270 = x + .7651 + .2858$	$+ .016$
58		18	11.2	$+ .221 = x + .7196 + .2970$	$+ .059$
59		26	10.3	$+ .247 = x + .6204 + .3187$	$+ .021$
60		30	10.8	$+ .169 = x + .5660 + .3297$	$+ .094$

No.	Date, 1888.	Equations of Condition.	Residuals.
	d. h.	″	″
61	May 2 12.2	$+0.175 = x + 0.5369\,\pi + 0.3354\,d\mu$	+0.084
62	4 11.2	$+ .191 = x + .5089 + .3408$	+ .065
63	8 11.5	$+ .179 = x + .4494 + .3516$	+ .070
64	10 13.0	$+ .136 = x + .4182 + .3574$	+ .110
65	12 12.1	$+ .189 = x + .3878 + .3628$	+ .054
66	17 11.4	$+0.343 = x + 0.3092 + 0.3762$	−0.109
67	20 13.3	$+ .175 = x + .2593 + .3848$	+ .053
68	24 13.0	$+ .334 = x + .1937 + .3958$	− .114
69	25 12.5	$+ .148 = x + .1776 + .3984$	+ .074
70	28 12.0	$+ .271 = x + .1111 + .4066$	− .060
71	29 12.8	$+0.186 = x + 0.0939 + 0.4094$	+0.023
72	31 13.3	$+ .225 = x + .0766 + .4149$	− .017
73	June 7 11.0	$+ .161 = x - .0397 + .4338$	+ .033
74	10 11.4	$+ .251 = x - .0905 + .4421$	− .062
75	14 12.3	$+ .206 = x - .1583 + .4532$	− .025
76	17 12.0	$+0.173 = x - 0.2078 + 0.4614$	+0.002
77	22 11.2	$+ .166 = x - .2889 + .4750$	.000
78	July 1 11.3	$+ .195 = x - .4306 + .4996$	− .045
79	3 11.9	$+ .147 = x - .4615 + .5051$	.000
80	5 12.5	$+ .073 = x - .4914 + .5107$	+ .071
81	9 10.8	$+0.295 = x - 0.5480 + 0.5215$	−0.158
82	12 11.4	$+ .124 = x - .5899 + .5297$	+ .008
83	17 10.6	$+ .081 = x - .6557 + .5434$	+ .043
84	20 11.5	$+ .257 = x - .6939 + .5516$	− .136
85	23 12.2	$+ .204 = x - .7298 + .5599$	− .088
86	26 11.1	$+0.207 = x - 0.7633 + 0.5681$	−0.094

Treating these equations in the usual method, the following normal equations result:—

$$\begin{aligned} +19''.083 &= +86.0000\,x + 3.6042\,d\mu - 4.3332\,\pi \\ +1.056 &= +3.6042 + 11.6258 + 10.8332 \\ +2.235 &= -4.3332 + 10.8332 + 40.3528 \end{aligned}$$

whence, by solution, are obtained the values of the unknowns, viz.—

$$\begin{aligned} x &= +0''.230 \\ d\mu &= -0.0735 \\ \pi &= +0.0998. \end{aligned}$$

It further appears that the probable error of one complete measure of distance is $\pm 0''.095$, and that the probable error of the determination of π is $\pm 0''.0175$.

The collected results for the Parallax of Polaris, gathered from the preceding pages, are as follows:—

Star's Name.	Mag.	Relative Annual Parallax.	Probable Error of Parallax.	Probable Error of one Complete Measure of Distance.
		″	″	″
D.M. + 88°, No. 2	8.2	+ 0.0837	± 0.0232	± 0.109
„ + 88 „ 9	8.3	+ 0.0780	± 0.0169	± 0.084
„ + 88 „ 4	6.8	+ 0.0521	± 0.0114	± 0.070
„ + 88 „ 10	9.8	+ 0.0998	± 0.0175	± 0.095

The difference of the above parallax, relatively to the stars D.M. + 88°, Nos. 4 and 10, is so considerable, and so much greater than their probable errors, that it will be worth while to enquire, whether the relative parallaxes of these two stars of comparison cannot be effectually determined from independent measurements. It will be seen that a similar remark applies in the case of *a* Cephei. This practical enquiry must, however, be deferred to some early but convenient opportunity.

II.

Parallax of Stars of the Second Magnitude, derived from observations at selected critical epochs.

The time and labour necessarily expended on obtaining the foregoing results, although probably less than would be required by the application of the Heliometer, are, nevertheless, so considerable, that the thought naturally suggested itself, whether there might not exist some possible modification, whereby the labour could be curtailed, without sensibly impairing the accuracy of the final determination, estimated by its applicability to cosmical enquiries. Accordingly, a selection was made of those observations of 61 Cygni, which necessarily affect the computed amount of parallax in the most sensible degree. Such observations are found on or about those nights, when the positions of the earth are such as to produce the maximum difference of displacement of the principal star in the direction of the star of comparison. Such positions of the earth occur, for the stars (a or b) in reference to 61 Cygni, on or about April 10 and October 10. Taking, then, the observations made during the ten nights nearest to these dates, and treating these twenty results after the same fashion as that adopted for the eighty-nine observations of the whole year, the following results are obtained:—

$$61_1 \text{ Cygni and star } (a),\ \pi = 0''.3669 \pm 0''.0264$$
$$61_2 \text{ Cygni ,, ,, } \pi = .4047 \pm .0238$$
$$61_1 \text{ Cygni and star } (b),\ \pi = .3929 \pm .0319$$
$$61_2 \text{ Cygni ,, ,, } \pi = .4713 \pm .0324$$

while for the whole eighty-nine the following values of π have been found (p. 65):—

$$61_1 \text{ Cygni and star } (a),\ \pi = 0''.4294 \pm 0''.0162$$
$$61_2 \text{ Cygni ,, ,, } \pi = .4250 \pm .0176$$
$$61_1 \text{ Cygni and star } (b),\ \pi = .4414 \pm .0222$$
$$61_2 \text{ Cygni ,, ,, } \pi = .4508 \pm .0191$$

Hence then it appears that the differential Parallax, with regard to the stars of comparison, is virtually the same, whether determined from the greater or fewer number of observations, and herein lies the justification of a curtailment of the process on the lines suggested. It may further be remarked, that while the limit of error of determination is about 0″.015, from observations made consecutively throughout the year, the limit of error, possibly incurred by this contracted method does not exceed 0″.03; an amount which appears to be sufficiently small to warrant the adoption of the results in cosmical enquiries, within the approximations at present available. Moreover, it is an obvious advantage to have the means of rapidly increasing the number of

stars whose parallax is sought; the curtailment in question also has practically received the approval of astronomers of great experience.

This contracted method, however, is not necessarily restricted to operations connected with the photographic method, but it applies equally to the Heliometric process, or in fact to any other micrometrical practice: nor is it to be regarded as the same as that so ably applied by Dr. Ball in his parallactic investigations, made at Dunsink in 1876–8. In the case of the Dunsink investigations, it would appear that while the number of nights devoted to the examination of a single star is possibly sufficient to detect a parallax of approximately a second of arc, still, as a matter of fact, no such large parallaxes were sifted out in the process, and in all probability no such contiguities, as that implied by a parallax of a second of arc, exist in the sidereal system: hence, the meshes of such an astronomical sieve appear too coarse for the object intended. Independently of this coarseness of the astronomical meshes, there is the further difference between the two processes, that the photographic method admits the employment of a very much wider telescopic field than is the case with an ordinary telescope, and it is thus possible to select stars of comparison much more suitably situated for the determination of parallax, than is the case with other telescopes, armed with an ordinary micrometer. Moreover, the stars of comparison themselves may be selected from a much wider range of magnitudes than is the case with object-glasses in general.

On the other hand, the curtailed method described by Dr. Gill, wherein he proposes to confine the observations to a couple of nights, repeated at proper intervals during two years, is more delicate than that last described, and may, on trial, prove sufficiently so to rapidly furnish, on a large scale, parallaxes accurate enough to afford an approximate notion of the cosmical distribution of stars.

The recent proposition to take photographs at critical epochs, and after retaining them in an undeveloped state, to re-expose them after intervals of six months, seems to me to be well worth a trial, and though attended by risk and difficulty, I propose to try it on a small scale.

Very recently, and while writing these remarks, the attention of astronomers has been called to a very remarkable and valuable contribution, emanating from the observatory at Pulkova, towards a practical improvement in the method of obtaining stellar parallaxes of an *absolute* character, from observations made on the meridian at properly selected epochs. If the character of meridional observation be of the highest order of reliability, then it is not too much to say that in the case of many stars, suitably situated, every year's observation of R.A. must implicitly contain the effects of parallax, and in most cases may permit their determination. If this be so, the data for deriving an approximate notion of the arrangement of stars in space, already exist in the annals of our great observatories; and in any case we have here, from the work of Drs. Wagner and Belopolsky, an indication of the expectations that may be derived from improvements in meridional instruments and meridional methods. Dr. Belopolsky's determination of the *absolute* parallax of 61 Cygni as derived from eight years' consecutive transit observations at Pulkova is $0''.50$.

Before proceeding to give the details of this curtailed method, as applied to *a* Cassiopeiæ and other stars of the second magnitude, it may be well here to make a remark which more properly belongs to page 5 of the Introduction. It is to the effect that the average amount of correction here required for the measures of distances, owing to variations in the film, in the focal length of the mirror, and other causes, known and unknown, is (from a partial enquiry) 0″.16 for 1000″, whereas in the case of the Cape Heliometer it appears to be 0″.10 for the same distance: a result probably due to the minute, but slightly inconstant, variations of the film.

PARALLAX OF a CASSIOPEIÆ

Deduced from Observations at Critical Epochs.

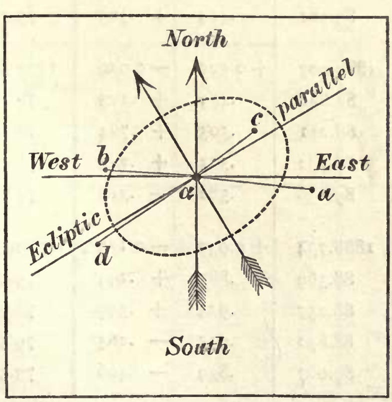
The stars selected from comparison are—

D.M. + 55°, No. 142	...	Magnitude	8.7	...	Star	*a*
D.M. + 55°, „ 128	...	„	9.2	...	„	*b*
Anonymous ...	...	„	10.2	...	„	*c*
D.M. + 55°, No. 132	...	„	9.3	...	„	*d*

The approximate position-angles and distances of these four stars are—

		° ′			″
for star *a*	...	*p* = 96 30	...	*s* =	1042
„ *b*	...	= 270 46	...	=	849
„ *c*	...	= 51 14	...	=	667
„ *d*	...	= 234 44	...	=	1113

The accompanying figure is a diagram, showing the relative positions of these stars with the form and position of the parallactic ellipse.



The parallactic factors in the equations of condition have been computed from the expressions—

$$\text{Star } a \ldots ds = R\,[9.94968]\cos(\odot - 273^\circ\ 31')$$
$$,,\ b \ldots ds = R\,[9.96190]\cos(\odot - 98\ \ 37)$$
$$,,\ c \ldots ds = R\,[9.99957]\cos(\odot - 309\ \ 0)$$
$$,,\ d \ldots ds = R\,[9.99998]\cos(\odot - 126\ \ 27)$$

The proper motion of α Cassiopeiæ, after consulting various authorities, has been assumed—

in R.A. $+0^s.0068$
in Decl^n. $-0''.042$

These preliminary facts will, with the information already afforded, permit the subsequent tables to be easily followed.

TABLE I.

Measures of the diagonal distances of Star (a) *from Star* (b), *and of Star* (c) *from Star* (d), *for the determination, at the times of exposure of the correction to their measured distances from α Cassiopeiæ.*

No. for Reference.	Date of Exposure of Plate. 1887–8.			Measured Distance of (*a*) to (*b*) in Arc.	Corrections for Refraction and Aberration.	Difference from Assumed Mean. 1889″.50.	Measured Distance of (*c*) to (*d*) in Arc.	Corrections for Refraction and Aberration.	Difference from Assumed Mean. 1779″.90.
		d.	h.	″	″	″	″	″	″
1	87 Dec.	16	5.0	1888.723	+0.474	+0.303	1779.441	+0.439	+0.020
2		17	6.3	89.339	.435	− .274	79.749	.413	− .262
3		23	5.2	89.190	.446	− .136	79.887	.416	− .403
4		27	5.6	89.503	.426	− .429	79.717	.403	− .220
5	88 Jan.	3	5.4	89.581	.424	+ .505	79.197	.392	+ .311
6		29	6.9	1889.007	+0.522	−0.029	1779.367	+0.469	+0.064
7	Feb.	1	6.1	88.848	.479	+ .173	79.478	.431	− .009
8		3	6.3	88.271	.505	+ .724	78.832	.442	+ .626
9		4	6.6	88.732	.525	+ .243	78.909	.476	+ .515
10		10	6.7	89.236	.582	− .318	79.640	.530	− .270
11	June	22	14.0	1888.734	+0.939	−0.173	1779.139	+0.679	+0.082
12		30	13.9	88.369	.887	+ .244	79.042	.683	+ .175
13	July	3	13.4	88.257	.934	+ .309	78.617	.687	+ .596
14		5	13.4	88.852	.913	− .265	79.525	.686	− .311
15		9	13.8	89.067	.839	− .406	79.383	.681	− .164

No. for Reference.	Date of Exposure of Plate. 1888.	Measured Distance of (*a*) to (*b*) in Arc.	Corrections for Refraction and Aberration.	Difference from Assumed Mean. 1889″.50.	Measured Distance of (*c*) to (*d*) in Arc.	Corrections for Refraction and Aberration.	Difference from Assumed Mean. 1779″.90.
	d. h.	″	″	″	″	″	″
16	Aug. 2 12.8	1888.431	+0.792	+0.277	1779.139	+0.676	+0.085
17	5 13.2	88.379	.740	+ .381	78.728	.662	+ .510
18	6 11.8	88.514	.861	+ .125	79.242	.690	— .032
19	7 12.7	88.758	.771	— .029	79.083	.671	+ .146
20	8 12.9	88.932	.737	— .169	79.520	.665	— .285
21	Dec. 13 6.9	1888.659	+0.436	+0.405	1779.113	+0.415	+0.372
22	18 7.2	88.789	.433	+ .278	79.401	.403	+ .096
23	22 5.8	89.452	.431	— .383	80.017	.408	— .525
24	26 6.2	89.152	.422	— .074	79.886	.398	— .384
25	28 7.2	88.817	.433	+ .250	79.092	.403	+ .405

NOTES.

No. 2. Images diffused: clouds passing at intervals.
No. 4. One of the plates rejected on account of discordant measures.
No. 7. The images elongated.
No. 9. A plate rejected on account of injury to film.
No. 11. The exposure was continued for ten minutes on account of haze.
No. 13. Clouds passing: the exposures sometimes interrupted.
No. 19. The sky very variable from passing clouds: the images large and diffused.
No. 21. A plate rejected owing to large discordant measures: no cause could be detected.
No. 25. Sky foggy. Exposure continued for ten minutes.

TABLE II.

Concluded measures of α Cassiopeiæ from the comparison Stars (a) *and* (b).

No. for Reference.	Date of Exposure of Plate. 1887–8.	Measured Distance of Star (*a*) to α Cassiopeiæ.	Sum of Corrections.	Concluded Distance of Star (*a*).	Measured Distance of Star (*b*) to α Cassiopeiæ.	Sum of Corrections.	Concluded Distance of Star (*b*).
	d. h.	″	″	″	″	″	″
1	87 Dec. 16 5.0	1042.311	+0.431	1042.742	848.906	+0.357	849.263
2	17 6.3	42.551	+ .085	42.636	49.318	+ .074	49.392
3	23 5.2	42.645	+ .169	42.814	49.107	+ .140	49.247
4	27 5.6	42.779	— .004	42.775	49.413	— .002	49.411
5	88 Jan. 3 5.4	42.113	+ .507	42.620	48.771	+ .412	49.183

No. for Reference.	Date of Exposure of Plate. 1888.			Measured Distance of Star (a) to α Cassiopeiæ.	Sum of Corrections.	Concluded Distance of Star (a).	Measured Distance of Star (b) to α Cassiopeiæ.	Sum of Corrections.	Concluded Distance of Star (b).
		d.	h.	"	"	"	"	"	"
6	Jan.	29	6.9	1042.505	+0.274	1042.779	849.015	+0.217	849.232
7	Feb.	1	6.1	42.430	.363	42.793	48.986	.288	49.274
8		3	6.3	41.919	.678	42.597	48.869	.542	49.411
9		4	6.6	42.354	.288	42.642	49.001	.341	49.342
10		10	6.7	42.642	.143	42.785	49.060	.109	49.169
11	June	22	14.0	1042.348	+0.455	1042.803	849.040	+0.313	849.353
12		30	13.9	42.047	.658	42.705	49.005	.475	49.480
13	July	3	13.4	41.916	.723	42.639	49.013	.526	49.539
14		5	13.4	42.311	.392	42.703	49.004	.356	49.360
15		9	13.8	42.367	.271	42.638	49.129	.163	49.292
16	Aug.	2	12.8	1041.967	+0.626	1042.593	848.934	+0.445	849.379
17		5	13.2	42.068	.653	42.721	48.958	.470	49.428
18		6	11.8	42.079	.583	42.662	49.049	.406	49.455
19		7	12.7	42.197	.446	42.643	49.041	.299	49.340
20		8	12.9	42.157	.358	42.515	49.204	.225	49.429
21	Dec.	13	6.9	1042.251	+0.524	1042.775	849.132	+0.334	849.466
22		18	7.2	42.159	.452	42.611	48.974	.265	49.239
23		22	5.8	42.839	.087	42.926	49.262	.035	49.297
24		26	6.2	42.452	.256	42.708	49.243	.099	49.342
25		28	7.2	42.211	.439	42.650	49.157	.247	49.404

TABLE III.

Equations of Condition formed from the concluded distances of α Cassiopeiæ from Star (a), *as given in Table II.*

No.	Date, 1887–8.			Equations of Condition.	Residuals.
		d.	h.	"	"
1	87 Dec.	16	5.0	$+0.242 = x + 0.8656\,\pi - 0.0439\,d\mu$	−0.010
2		17	6.3	$+ .136 = x + .8678 - .0411$	+ .094
3		23	5.2	$+ .314 = x + .8756 - .0248$	− .081
4		27	5.6	$+ .275 = x + .8752 - .0138$	− .043
5	88 Jan.	3	5.4	$+ .120 = x + .8642 + .0061$	+ .111

No.	Date, 1888.			Equations of Condition.	Residuals.
		d.	h.	″	″
6	Jan.	29	6.9	$+0.279 = x + 0.7112\pi + 0.0775\,d\mu$	-0.054
7	Feb.	1	6.1	$+ .293 = x + .6834 + .0856$	$- .070$
8		3	6.3	$+ .097 = x + .6636 + .0911$	$+ .125$
9		4	6.6	$+ .142 = x + .6533 + .0939$	$+ .080$
10		10	6.7	$+ .285 = x + .5883 + .1103$	$- .065$
11	June	22	14.0	$+0.303 = x - 0.9049 + 0.4725$	-0.140
12		30	13.9	$+ .205 = x - .9005 + .4917$	$- .042$
13	July	3	13.4	$+ .139 = x - .8946 + .5026$	$+ .023$
14		5	13.4	$+ .203 = x - .8894 + .5081$	$- .041$
15		9	13.8	$+ .138 = x - .8762 + .5191$	$+ .024$
16	Aug.	2	12.8	$+0.093 = x - 0.7164 + 0.5847$	$+0.074$
17		5	13.2	$+ .221 = x - .6858 + .5929$	$- .053$
18		6	11.8	$+ .162 = x - .6781 + .5956$	$+ .006$
19		7	12.7	$+ .143 = x - .6676 + .5984$	$+ .025$
20		8	12.9	$+ .015 = x - .6571 + .6011$	$+ .153$
21	Dec.	13	6.9	$+0.275 = x + 0.8596 + 0.9481$	-0.062
22		18	7.2	$+ .111 = x + .8710 + .9618$	$+ .102$
23		22	5.8	$+ .426 = x + .8752 + .9728$	$- .214$
24		26	6.2	$+ .208 = x + .8754 + .9837$	$+ .004$
25		28	7.2	$+ .150 = x + .8736 + .9892$	$+ .062$

Treating these equations in the usual method, the following normal equations result:—

$$\begin{aligned} +4.975'' &= +25.0000\,x + 10.6632\,d\mu + 4.1324\,\pi \\ +2.0066 &= +10.6632 \quad + 7.7764 \quad + 0.1772 \\ +1.3711 &= +4.1324 \quad + 0.1772 \quad + 16.0705 \end{aligned}$$

whence, by solution, are obtained the values of the unknowns, viz.—

$$\begin{aligned} x &= +0.202'' \\ d\mu &= -0.019 \\ \pi &= +0.0337. \end{aligned}$$

It further appears that the probable error of one complete measure of distance is $\pm 0''.091$, and that the probable error of π is $\pm 0''.0238$.

TABLE IV.

Equations of Condition formed from the measures of α Cassiopeiæ and Star (b), *as given in Table II.*

No.	Date, 1887–8.			Equations of Condition.			Residuals.
		d.	h.	$''$			$''$
1	87 Dec.	16	5.0	$+0.163 = x - 0.8738\,\pi$		$-0.0439\,d\mu$	-0.003
2		17	6.3	$+\ .292 = x - \ .8778$		$-\ .0411$	$-\ .132$
3		23	5.2	$+\ .147 = x - \ .8943$		$-\ .0248$	$+\ .014$
4		27	5.6	$+\ .311 = x - \ .8995$		$-\ .0138$	$-\ .149$
5	88 Jan.	3	5.4	$+\ .083 = x - \ .8983$		$+\ .0061$	$+\ .081$
6		29	6.9	$+0.132 = x - 0.7755$		$+0.0775$	$+0.044$
7	Feb.	1	6.1	$+\ .174 = x - \ .7506$		$+\ .0856$	$+\ .004$
8		3	6.3	$+\ .311 = x - \ .7325$		$+\ .0911$	$-\ .132$
9		4	6.6	$+\ .242 = x - \ .7229$		$+\ .0939$	$-\ .063$
10		10	6.7	$+\ .069 = x - \ .6624$		$+\ .1103$	$+\ .114$
11	June	22	14.0	$+0.253 = x + 0.9249$		$+0.4725$	$+0.033$
12		30	13.9	$+\ .380 = x + \ .9311$		$+\ .4917$	$-\ .091$
13	July	3	13.4	$+\ .439 = x + \ .9292$		$+\ .5026$	$-\ .150$
14		5	13.4	$+\ .260 = x + \ .9266$		$+\ .5081$	$+\ .029$
15		9	13.8	$+\ .192 = x + \ .9183$		$+\ .5191$	$+\ .098$
16	Aug.	2	12.8	$+0.279 = x + 0.7844$		$+0.5847$	$+0.013$
17		5	13.2	$+\ .328 = x + \ .7579$		$+\ .5929$	$-\ .036$
18		6	11.8	$+\ .355 = x + \ .7492$		$+\ .5956$	$-\ .063$
19		7	12.7	$+\ .240 = x + \ .7377$		$+\ .5984$	$+\ .052$
20		8	12.9	$+\ .329 = x + \ .7296$		$+\ .6011$	$-\ .038$
21	Dec.	13	6.9	$+0.366 = x - 0.8647$		$+0.9481$	-0.102
22		18	7.2	$+\ .139 = x - \ .8837$		$+\ .9618$	$+\ .125$
23		22	5.8	$+\ .197 = x - \ .8935$		$+\ .9728$	$+\ .068$
24		26	6.2	$+\ .242 = x - \ .8993$		$+\ .9837$	$+\ .024$
25		28	7.2	$+\ .304 = x - \ .9005$		$+\ .9892$	$-\ .037$

Treating these equations in the usual method, the following normal equations result:—

$$\begin{aligned} +5''.9210 &= +25.0000\,x + 10.6632\,d\mu - 4.1404\,\pi \\ +2.9373 &= +10.6632 \quad + 7.7764 \quad + 0.0004 \\ -0.1093 &= -\ 4.1404 \quad + 0.0004 \quad + 17.6742 \end{aligned}$$

whence, by solution, are obtained the values of the unknowns, viz.—

$$\begin{aligned} x &= +0''.199 \\ d\mu &= +0.105 \\ \pi &= +0.0403. \end{aligned}$$

It further appears that the probable error of one complete measure of distance is $\pm 0''.087$, and that the probable error of π is $\pm 0''.0198$.

PARALLAX OF α CASSIOPEIÆ, RELATIVELY TO STARS (C) *AND* (D).

TABLE V.

Concluded measures of α Cassiopeiæ from the comparison Stars (c) *and* (d).

No. for Reference.	Date of Exposure of Plate. 1887–8.			Measured Distance of Star (*c*) from α Cassiopeiæ.	Sum of Corrections.	Concluded Distance of Star (*c*) from α Cassiopeiæ.	Measured Distance of Star (*d*) from α Cassiopeiæ.	Sum of Corrections.	Concluded Distance of Star (*d*) from α Cassiopeiæ.
		d.	h.	″	″	″	″	″	″
1	87 Dec.	16	5.0	667.333	+0.170	667.503	1112.850	+0.289	1113.139
2		17	6.3	7.275	.055	7.330	13.177	.095	13.272
3		23	5.2	7.206	.005	7.211	13.176	.011	13.187
4		27	5.6	7.326	.067	7.393	13.241	.114	13.355
5	88 Jan.	3	5.4	7.162	.264	7.426	12.862	.441	13.303
6		29	6.9	666.899	+0.198	667.097	1112.894	+0.338	1113.232
7	Feb.	1	6.1	7.168	.161	7.329	13.110	.257	13.367
8		3	6.3	6.790	.403	7.193	12.443	.671	13.114
9		4	6.6	6.883	.372	7.255	12.573	.620	13.193
10		10	6.7	6.333	.098	7.431	12.241	.164	13.405
11	June	22	14.0	666.996	+0.291	667.287	1112.894	+0.468	1113.362
12		30	13.9	6.804	.328	7.132	12.885	.529	13.414
13	July	3	13.4	6.808	.487	7.295	12.564	.678	13.242
14		5	13.4	7.226	.147	7.373	13.163	.227	13.390
15		9	13.8	6.946	.203	7.149	12.889	.319	13.208
16	Aug.	2	12.8	666.931	+0.296	667.227	1112.904	+0.466	1113.370
17		5	13.2	6.934	.449	7.383	12.462	.721	13.183
18		6	11.8	6.951	.255	7.206	12.821	.401	13.222
19		7	12.7	6.830	.317	7.147	12.926	.501	13.427
20		8	12.9	7.038	.153	7.191	13.225	.225	13.450
21	Dec.	13	6.9	666.962	+0.313	667.275	1112.891	+0.473	1113.364
22		18	7.2	7.137	+ .205	7.342	12.937	+ .293	13.230
23		22	5.8	7.252	− .025	7.227	13.274	− .095	13.179
24		26	6.2	7.370	+ .023	7.393	13.166	− .013	13.153
25		28	7.2	6.967	+ .319	7.286	12.885	+ .484	13.369

TABLE VI.

Equations of Condition formed from the concluded distances of α Cassiopeiæ from Star (c), *as given in Table V.*

No.	Date, 1887–8.	d.	h.	Equations of Condition.	Residuals.
				$''$	$''$
1	87 Dec.	16	5.0	$+0.503 = x + 0.7011\,\pi - 0.0439\,d\mu$	-0.191
2		17	6.3	$.330 = x + .7137 - .0411$	$-.018$
3		23	5.2	$.211 = x + .7809 - .0248$	$+.103$
4		27	5.6	$.393 = x + .8213 - .0138$	$-.078$
5	88 Jan.	3	5.4	$.426 = x + .8819 + .0061$	$-.109$
6		29	6.9	$+0.097 = x + 0.9842 + 0.0775$	$+0.223$
7	Feb.	1	6.1	$.329 = x + .9828 + .0856$	$-.010$
8		3	6.3	$.193 = x + .9804 + .0911$	$+.126$
9		4	6.6	$.255 = x + .9788 + .0939$	$+.063$
10		10	6.7	$.431 = x + .9627 + .1103$	$-.113$
11	June	22	14.0	$+0.287 = x - 0.8108 + 0.4725$	-0.036
12		30	13.9	$.132 = x - .8851 + .4917$	$+.116$
13	July	3	13.4	$.295 = x - .9087 + .5026$	$-.048$
14		5	13.4	$.373 = x - .9234 + .5081$	$-.128$
15		9	13.8	$.149 = x - 0.9495 + .5191$	$+.095$
16	Aug.	2	12.8	$+0.227 = x - 1.0128 + 0.5847$	$+0.015$
17		5	13.2	$.383 = x - 1.0095 + .5929$	$-.142$
18		6	11.8	$.206 = x - 1.0077 + .5956$	$+.035$
19		7	12.7	$.147 = x - 1.0056 + .5984$	$+.095$
20		8	12.9	$.191 = x - 1.0032 + .6011$	$+.051$
21	Dec.	13	6.9	$+0.275 = x + 0.6738 + 0.9481$	$+0.017$
22		18	7.2	$.342 = x + .7347 + .9618$	$-.048$
23		22	5.8	$.227 = x + .7784 + .9728$	$+.069$
24		26	6.2	$.393 = x + .8190 + .9837$	$-.097$
25		28	7.2	$.286 = x + .8383 + .9892$	$+.011$

Treating these equations in the usual method, the following normal equations result:—

$$\begin{aligned} +7.''0880 &= +25.0000\,x + 10.6652\,d\mu + 3.1157\,\pi \\ +2.8748 &= +10.6632 \quad + 7.7764 \quad - 1.1329 \\ +1.5984 &= +\ 3.1157 \quad - 1.1329 \quad + 19.9150 \end{aligned}$$

whence, by solution, are obtained the values of the unknowns, viz.—

$$\begin{aligned} x &= +0.''287 \\ d\mu &= -0.019 \\ \pi &= +0.0343. \end{aligned}$$

It further appears that the probable error of one complete measure of distance is $\pm 0''.104$, and that the probable error of the determination of π is $\pm 0''.0247$.

TABLE VII.

Equations of Condition formed from the concluded distances of α Cassiopeiæ from Star (d), *as given in Table V.*

No.	Date, 1887–8.			Equations of Condition.	Residuals.
		d.	h.	$''$	$''$
1	87 Dec.	16	5.0	$+0.039 = x - 0.7316\,\pi - 0.0439\,d\mu$	+0.115
2		17	6.3	$.172 = x - .7435 - .0411$	− .017
3		23	5.2	$.087 = x - .8074 - .0248$	+ .066
4		27	5.6	$.255 = x - .8451 - .0138$	− .104
5	88 Jan.	3	5.4	$.203 = x - .9009 + .0061$	− .054
6		29	6.9	$+0.132 = x - 0.9838 + 0.0775$	+0.015
7	Feb.	1	6.1	$.267 = x - .9804 + .0856$	− .120
8		3	6.3	$.014 = x - .9763 + .0911$	+ .133
9		4	6.6	$.093 = x - .9739 + .0939$	+ .055
10		10	6.7	$.305 = x - .9533 + .1103$	− .157
11	June	22	14.0	$+0.262 = x + 0.8379 + 0.4725$	−0.045
12		30	13.9	$.314 = x + .9072 + .4917$	− .095
13	July	3	13.4	$.142 = x + .9287 + .5026$	+ .078
14		5	13.4	$.290 = x + .9421 + .5081$	− .070
15		9	13.8	$.108 = x + 0.9654 + .5191$	+ .113
16	Aug.	2	12.8	$+0.270 = x + 1.0111 + 0.5847$	−0.046
17		5	13.2	$.083 = x + 1.0055 + .5929$	+ .140
18		6	11.8	$.122 = x + 1.0030 + .5956$	+ .101
19		7	12.7	$.327 = x + 1.0002 + .5984$	− .104
20		8	12.9	$.350 = x + 1.9970 + .6011$	− .127
21	Dec.	13	6.9	$+0.264 = x - 0.7055 + 0.9481$	−0.097
22		18	7.2	$.130 = x - .7635 + .9618$	+ .036
23		22	5.8	$.079 = x - .8048 + .9728$	+ .086
24		26	6.2	$.053 = x - .8429 + .9837$	+ .110
25		28	7.2	$.269 = x - .8608 + .9892$	− .106

Treating these equations in the usual method, the following normal equations result:—

$$\begin{aligned} +4.5300'' &= +25.0000\,x + 10.6632\,d\mu - 3.2756\,\pi \\ +2.0715 &= +10.6632 \quad + 7.7764 \quad + 1.0536 \\ +0.1394 &= -\ 3.2756 \quad + 1.0536 \quad + 20.4262 \end{aligned}$$

whence, by solution, are obtained the values of the unknowns, viz.—

$$\begin{aligned} x &= +0.181'' \\ d\mu &= +0.012 \\ \pi &= +0.0352. \end{aligned}$$

It further appears that the probable error of one complete measure of distance is $\pm 0''.102$, and that the probable error of the determination of π is $\pm 0'.0239$.

The collected results for the parallax of α Cassiopeiæ gathered from the preceding pages, are as follows:—

Star's Name.	Mag.	Relative Annual Parallax.	Probable Error of Parallax.	Probable Error of one Complete Measure of Distance.
		″	″	″
D.M. 55°, No. 142	8.7	+0.0337	±0.0238	±0.091
„ 55°, No. 128	9.2	+0.0403	±0.0198	±0.087
Anon.	10.2	+0.0343	±0.0247	±0.104
D.M. 55°, No. 132	9.3	+0.0352	±0.0239	±0.102

There is not, so far as I am aware, any determination of the parallax of this star by any other astronomer. The results here presented seem to be in accordance with the hypothesis that the stars of comparison are in the same group with each other and the principal star, α Cassiopeiæ.

PARALLAX OF β CASSIOPEIÆ

Deduced from Observations at Critical Epochs.

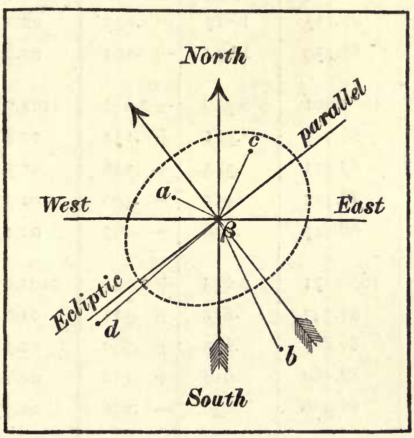
The stars selected for the determination of the relative parallax of β Cassiopeiæ are—

D.M. + 58°, No. 1,	...	Magnitude 9.2	...	Star	*a*
D.M. + 58°, No. 10,	...	„ 9.1	...	„	*b*
D.M. + 58°, No. 8,	...	„ 8.3	...	„	*c*
D.M. + 58°, No. 2700,	...	„ 9.2	...	„	*d*.

The approximate position-angles and distances of these four stars, are—

for star (*a*)	...	$p = 299^\circ\ 47'$	...	$s = 440''$
„ (*b*)	...	$= 153\ 30$	...	$= 1306$
„ (*c*)	...	$= 27\ 20$	...	$= 664$
„ (*d*)	...	$= 229\ 56$	...	$= 1475.$

The accompanying figure is a diagram showing the relative position of these stars, with the form and position of the parallactic ellipse.



The parallactic factors in the equations of condition have been computed from the expressions—

$$\text{Star } (a) \quad \ldots \quad ds = R\,[9.90879] \cos(\odot - 59^\circ\ 29')$$
$$\text{„ } (b) \quad \ldots \quad ds = R\,[9.89878] \cos(\odot - 197\ \ 7)$$
$$\text{„ } (c) \quad \ldots \quad ds = R\,[9.98634] \cos(\odot - 322\ \ 2)$$
$$\text{„ } (d) \quad \ldots \quad ds = R\,[9.99999] \cos(\odot - 124\ \ 1).$$

The proper motion of β Cassiopeiæ after consulting various authorities has been assumed, in

R.A. $+0^s.0701$
Decl^n. $-0''.204$.

These preliminary data will, with the information already afforded, permit the subsequent tables to be easily followed.

TABLE I.

Measures of the diagonal distances of Star (a) *from Star* (b) *and of Star* (c) *from Star* (d), *for the determination at the times of exposure of the correction to their measured distances from β Cassiopeiæ.*

No. for Reference.	Date of Exposure of Plate. 1887–8.				Measured Distance of (a) to (b) in Arc.	Correction for Refraction and Aberration.	Difference from Assumed Mean. 1688″.90.	Measured Distance of (c) to (d) in Arc.	Correction for Refraction and Aberration.	Difference from Assumed Mean. 2102″.80.
			d.	h.	″	″	″	″	″	″
1	87	Oct.	22	10.3	1687.872	+0.517	+0.511	2101.855	+0.600	+0.345
2			24	10.8	88.505	.518	− .123	02.464	.593	− .257
3			25	10.2	88.771	.511	− .382	02.830	.591	− .621
4		Nov.	14	9.8	88.508	.488	− .096	02.228	.553	+ .019
5			15	10.5	87.895	0.491	+ .514	01.506	.570	+ .724
6	88	Jan.	26	6.7	1686.297	+2.274	+0.329	2102.043	+0.624	+0.133
7			28	6.4	87.541	1.772	− .413	02.565	.482	− .247
8		Feb.	1	6.9	86.784	2.105	+ .011	02.368	.561	− .129
9			3	6.4	87.115	1.817	− .032	02.275	.493	+ .032
10			4	6.4	87.559	1.633	− .292	02.681	.465	− .346
11		Apr.	11	13.9	1689.001	+0.516	−0.617	2102.734	+0.638	−0.572
12			14	14.5	88.247	.521	+ .132	01.866	.644	+ .290
13			26	13.2	88.111	.543	+ .246	01.746	.740	+ .314
14		May	3	13.2	88.725	.555	− .380	02.375	.697	− .272
15			4	13.5	88.247	.556	+ .097	02.153	.730	− .083
16		Aug.	2	13.4	1688.271	+0.625	+0.004	2102.036	+0.736	+0.028
17			3	13.9	87.743	.645	+ .512	01.636	.750	+ .414
18			6	12.9	87.887	.633	+ .380	01.556	.741	+ .503
19			7	13.4	88.160	.618	+ .122	02.106	.754	− .060
20			8	12.9	88.566	.630	− .296	02.376	.766	− .342
21		Oct.	19	12.1	1688.059	+0.539	+0.302	2101.965	+0.624	+0.211
22			30	11.0	88.575	.530	− .205	02.295	.584	− .079
23		Nov.	9	9.4	88.544	.489	− .133	02.655	.557	− .412
24			13	10.3	88.505	.487	− .092	02.513	.552	− .265
25			17	10.6	88.521	.491	− .112	02.201	.560	+ .039

NOTES.

No. 3. The images of the comparison stars faint.
No. 5. One of the plates rejected: the measures being grossly discordant.
No. 9. Exposure 10 minutes: sky hazy.
No. 11. One of the plates not measured, the film being accidentally injured.
No. 14. Clouds passing: the exposures of unequal length.
No. 19. The sky very variable from passing clouds: the images large and diffused.
No. 21. The images elliptical from inadequate driving.
No. 23. One of the plates rejected owing to accidental injury to the film.

TABLE II.

Concluded measures of β Cassiopeiæ from the comparison Stars (a) *and* (b).

No. for Reference.	Date of Exposure of Plate. 1887–8.			Measured Distance of Star (*a*) from β Cassiopeiæ.	Sum of Corrections.	Concluded Distance of Star (*a*).	Measured Distance of Star (*b*) from β Cassiopeiæ.	Sum of Corrections.	Concluded Distances of Star (*b*).
		d.	h.	″	″	″	″	″	″
1	87 Oct.	22	10.3	439.801	+ 0.372	440.173	1304.882	+ 0.691	1305.573
2		24	10.8	40.021	.204	40.225	05.226	+ .203	05.429
3		25	10.2	40.108	.132	40.240	05.472	— .001	05.471
4	Nov.	14	9.8	39.910	.172	40.082	05.384	+ .221	05.605
5		15	10.5	39.807	.333	40.140	04.680	+ .692	05.372
6	88 Jan.	26	6.7	439.728	+ 0.504	440.232	1303.370	+ 1.959	1305.329
7		28	6.4	40.102	.247	40.349	04.447	0.997	05.444
8	Feb.	1	6.9	39.926	.391	40.317	03.928	1.574	05.502
9		3	6.4	39.855	.328	40.183	04.051	1.267	05.318
10		4	6.4	39.993	+ .239	40.232	04.261	0.943	05.204
11	Apr.	11	13.9	440.555	— 0.183	440.372	1305.291	+ 0.002	1305.293
12		14	14.5	40.575	+ .008	40.583	04.824	.589	05.413
13		26	13.2	39.496	+ .029	40.525	04.488	.704	05.192
14	May	3	13.2	40.485	— .146	40.339	05.187	.241	05.428
15		4	13.5	40.519	— .022	40.497	04.616	.610	05.226
16	Aug.	2	13.4	440.601	— 0.177	440.424	1304.762	+ 0.713	1305.475
17		3	13.9	40.312	.050	40.262	04.511	1.081	05.592
18		6	12.9	40.469	.076	40.393	04.382	1.001	05.383
19		7	13.4	40.647	.146	40.501	04.519	0.798	05.317
20		8	12.9	40.539	.265	40.274	05.022	0.480	05.502
21	Oct.	19	12.1	440.423	— 0.221	440.202	1304.340	+ 1.129	1305.469
22		30	11.0	40.540	.405	40.135	05.050	0.565	05.615
23	Nov.	9	9.4	40.782	.411	40.371	04.987	.615	05.602
24		13	10.3	40.424	.402	40.022	04.777	.647	05.424
25		17	10.6	40.488	.409	40.079	04.670	.636	05.306

TABLE III.

Equations of Condition formed from the concluded distances of β Cassiopeiæ from Star (a), *as given in Table II.*

No.	Date, 1887–8.			Equations of Condition.	Residuals.
		d.	h.	$''$	$''$
1	87 Oct.	22	10.3	$+0.173 = x - 0.7173\,\pi \;\; - 0.1939\,d\mu$	+0.006
2		24	10.8	$.225 = x - .7298 \;\; - .1884$	− .049
3		25	10.2	$.240 = x - .7352 \;\; - .1856$	− .065
4	Nov.	14	9.8	$.082 = x - .7956 \;\; - .1309$	+ .081
5		15	10.5	$.140 = x - .7971 \;\; - .1281$	+ .022
6	88 Jan.	26	6.7	$+0.232 = x - 0.3121 \;\; + 0.0692$	+0.027
7		28	6.4	$.349 = x - .2861 \;\; + .0747$	− .085
8	Feb.	1	6.9	$.317 = x - .2320 \;\; + .0857$	− .042
9		3	6.4	$.183 = x - .2057 \;\; + .0913$	+ .097
10		4	6.4	$.232 = x - .1920 \;\; + .0939$	+ .051
11	Apr.	11	13.9	$+0.372 = x + 0.6516 \;\; + 0.2781$	+0.078
12		14	14.5	$.583 = x + .6764 \;\; + .2863$	− .128
13		26	13.2	$.525 = x + .7223 \;\; + .3192$	− .061
14	May	3	13.2	$.339 = x + .7887 \;\; + .3384$	+ .137
15		4	13.5	$.497 = x + .7925 \;\; + .3411$	− .019
16	Aug.	2	13.4	$+0.424 = x + 0.2576 \;\; + 0.5874$	−0.056
17		3	13.9	$.262 = x + .2443 \;\; + .5902$	+ .105
18		6	12.9	$.393 = x + .2187 \;\; + .5984$	− .031
19		7	13.4	$.501 = x + .1918 \;\; + .6011$	− .145
20		8	12.9	$.274 = x + .1780 \;\; + .6038$	+ .080
21	Oct.	19	12.1	$+0.202 = x - 0.6819 \;\; + 0.8009$	−0.021
22		30	11.0	$.135 = x - .7489 \;\; + .8310$	+ .032
23	Nov.	9	9.4	$.371 = x - .7865 \;\; + .8584$	− .211
24		13	10.3	$.022 = x - .7949 \;\; + .8694$	+ .136
25		17	10.6	$.079 = x - .7995 \;\; + .8804$	+ .078

Treating these equations in the usual method, the following normal equations result:—

$$\begin{aligned} +7''.152 &= +25.0000\,x + 8.3720\,d\mu - 4.0927\,\pi \\ +2.4675 &= +\;\;8.3720 \quad +6.0450 \quad -0.9371 \\ +0.4923 &= -\;\;4.0927 \quad -0.9371 \quad +8.9803 \end{aligned}$$

whence, by solution, are obtained the following values of the unknowns, viz.—

$$\begin{aligned} x &= +0''.321 \\ d\mu &= -0.0047 \\ \pi &= +0.2004. \end{aligned}$$

It further appears that the probable error of one complete measure of distance is $\pm 0''.097$, and that the probable error of π is $\pm 0''.0336$.

TABLE IV.

Equations of Condition formed from the concluded distances of β Cassiopeiæ and Star (b), *as given in Table II.*

No.	Date, 1887–8.			Equations of Condition.	Residuals.
		d.	h.	"	"
1	87 Oct.	22	10.3	$+0.473 = x + 0.7607\,\pi - 0.1939\,d\mu$	-0.068
2		24	10.8	$.329 = x + .7530 - .1884$	$+ .075$
3		25	10.2	$.371 = x + .7485 - .1856$	$+ .033$
4	Nov.	14	9.8	$.505 = x + .6408 - .1309$	$- .116$
5		15	10.5	$.272 = x + .6339 - .1281$	$+ .116$
6	88 Jan.	26	6.7	$+0.229 = x - 0.2565 + 0.0692$	$+0.043$
7		28	6.4	$.344 = x - .2824 + .0747$	$- .075$
8	Feb.	1	6.9	$.402 = x - .3337 + .0857$	$- .140$
9		3	6.4	$.218 = x - .3561 + .0913$	$+ .041$
10		4	6.4	$.104 = x - .3705 + .0939$	$+ .155$
11	Apr.	11	13.9	$+0.193 = x - 0.7910 + 0.2781$	$+0.008$
12		14	14.5	$.313 = x - .7867 + .2863$	$- .112$
13		26	13.2	$.092 = x - .7494 + .3192$	$+ .114$
14	May	3	13.2	$.328 = x - .7130 + .3384$	$- .117$
15		4	13.5	$.126 = x - .7068 + .3411$	$+ .086$
16	Aug.	2	13.4	$+0.373 = x + 0.3265 + 0.5874$	-0.032
17		3	13.9	$.492 = x + .3388 + .5902$	$- .150$
18		6	12.9	$.283 = x + .3744 + .5984$	$+ .063$
19		7	13.4	$.217 = x + .3858 + .6011$	$+ .130$
20		8	12.9	$.402 = x + .3977 + .6038$	$- .053$
21	Oct.	19	12.1	$+0.369 = x + 0.7766 + 0.8009$	$+0.026$
22		30	11.0	$.513 = x + .7347 + .8310$	$- .124$
23	Nov.	9	9.4	$.502 = x + .6731 + .8584$	$- .121$
24		13	10.3	$.324 = x + .6425 + .8694$	$+ .053$
25		17	10.6	$.206 = x + .6087 + .8804$	$+ .168$

Treating these equations in the usual method, the following normal equations result:—

$$\begin{aligned} +7''.980 &= +25.0000\,x + 8.3720\,d\mu + 3.4496\,\pi \\ +2.7570 &= +\ \ 8.3720 \quad +6.0450 \quad +2.0976 \\ +2.1621 &= +\ \ 3.4496 \quad +2.0976 \quad +8.9015 \end{aligned}$$

whence, by solution, are obtained the following values of the unknowns, viz.—

$$\begin{aligned} x &= +0''.306 \\ d\mu &= -0.0127 \\ \pi &= +\mathbf{0.1277}. \end{aligned}$$

It further appears that the probable error of one complete measure of distance is $\pm 0''.106$, and that the probable error of π is $\pm 0''.0374$.

TABLE V.

Concluded measures of β Cassiopeiæ from the comparison Stars (c) and (d).

No. for Reference.	Date of Exposure of Plate. 1887–8.	Measured Distance of Star (c) from β Cassiopeiæ.	Sum of Corrections.	Concluded Distance of Star (c).	Measured Distance of Star (d) from β Cassiopeiæ.	Sum of Corrections.	Concluded Distance of Star (d).
	d. h.	"	"	"	"	"	"
1	87 Oct. 22 10.3	663.387	+ 0.286	663.673	1474.250	+ 0.717	1474.967
2	24 10.8	63.710	+ .092	63.802	74.833	.290	75.123
3	25 10.2	63.714	— .022	63.692	75.023	.031	75.054
4	Nov. 14 9.8	63.529	+ .170	63.699	74.481	.440	74.921
5	15 10.5	63.479	+ .394	63.873	74.098	.948	75.046
6	88 Jan. 26 6.7	663.508	+ 0.394	663.902	1474.398	+ 0.431	1474.829
7	28 6.4	63.619	.178	63.797	74.647	.125	74.772
8	Feb. 1 6.9	63.604	.260	63.864	74.686	.220	74.906
9	3 6.4	63.571	.251	63.822	74.696	.316	75.012
10	4 6.4	63.921	.108	64.029	75.042	.051	75.093
11	Apr. 11 13.9	663.858	+ 0.028	663.886	1474.974	+ 0.139	1475.113
12	14 14.5	63.618	.304	63.922	74.653	.339	74.992
13	26 13.2	63.435	.336	63.771	74.719	.408	75.127
14	May 3 13.2	63.561	.142	63.703	74.999	.204	75.203
15	4 13.5	63.501	.212	63.713	74.738	.375	75.113
16	Aug. 2 13.4	663.358	+ 0.225	663.583	1474.921	+ 0.244	1475.165
17	3 13.9	63.425	.400	63.825	74.696	.633	75.329
18	6 12.9	63.387	.415	63.802	74.411	.682	75.093
19	7 13.4	63.274	.255	63.529	75.006	.308	75.314
20	8 12.9	63.390	.157	63.547	75.253	.095	75.348
21	Oct. 19 12.1	663.522	+ 0.071	663.593	1474.757	+ 0.365	1475.122
22	30 11.0	63.418	.213	63.631	74.791	+ .122	74.913
23	Nov. 9 9.4	63.650	.105	63.755	75.009	— .144	74.865
24	13 10.3	63.622	.148	63.770	75.180	— .042	75.138
25	17 10.6	63.645	.248	63.893	74.909	+ .183	75.092

TABLE VI.

Equations of Condition formed from the concluded distances of β Cassiopeiæ from Star (c), *as given in Table V.*

No.	Date, 1887–8.	d.	h.	Equations of Condition.	Residuals.
				″	″
1	87 Oct.	22	10.3	$+0.173 = x - 0.3272\,\pi - 0.1939\,d\mu$	+0.051
2		24	10.8	$.302 = x - .2948 - .1884$	− .074
3		25	10.2	$.192 = x - .2792 - .1856$	+ .038
4	Nov.	14	9.8	$.199 = x + .0033 - .1309$	+ .067
5		15	10.5	$.373 = x + .0206 - .1281$	− .103
6	88 Jan.	26	6.7	$+0.402 = x + 0.9186 + 0.0692$	−0.016
7		28	6.4	$.297 = x + .9273 + .0747$	+ .090
8	Feb.	1	6.9	$.364 = x + .9417 + .0857$	+ .025
9		3	6.4	$.322 = x + .9469 + .0913$	+ .067
10		4	6.4	$.529 = x + .9491 + .0939$	− .140
11	Apr.	11	13.9	$+0.386 = x + 0.4780 + 0.2781$	−0.059
12		14	14.5	$.422 = x + .4338 + .2863$	− .101
13		26	13.2	$.271 = x + .2499 + .3192$	+ .025
14	May	3	13.2	$.203 = x + .1369 + .3384$	+ .079
15		4	13.5	$.213 = x + .1203 + .3411$	+ .067
16	Aug.	2	13.4	$+0.083 = x - 0.9651 + 0.5874$	+0.054
17		3	13.9	$.325 = x - .9681 + .5902$	− .189
18		6	12.9	$.302 = x - .9747 + .5984$	− .161
19		7	13.4	$.029 = x - .9766 + .6011$	+ .112
20		8	12.9	$.047 = x - .9780 + .6038$	+ .094
21	Oct.	19	12.1	$+0.093 = x - 0.4076 + 0.8009$	+0.116
22		30	11.0	$.131 = x - .2345 + .8310$	+ .099
23	Nov.	9	9.4	$.255 = x - .0683 + .8584$	− .003
24		13	10.3	$.270 = x - .0005 + .8694$	− .009
25		17	10.6	$.393 = x + .0671 + .8804$	− .125

Treating these equations in the usual method, the following normal equations result:—

$$
\begin{aligned}
+\overset{\prime\prime}{6}.576 &= +25.0000\,x + 8.3720\,d\mu - 0.2811\,\pi \\
+1.8663 &= +\ \ 8.3720 \ \ + 6.0450 \ \ - 2.5107 \\
+1.2690 &= -\ \ 0.2811 \ \ - 2.5107 \ \ + 10.1318
\end{aligned}
$$

whence, by solution, are obtained the following values of the unknowns, viz.—

$$
\begin{aligned}
x &= +\overset{\prime\prime}{0}.266 \\
d\mu &= -0.0055 \\
\pi &= +0.1313.
\end{aligned}
$$

It further appears that the probable error of one complete measure of distance is $\pm 0''.097$, and that the probable error of π is $\pm 0''.0335$.

TABLE VII.

Equations of Condition formed from the concluded distances of β Cassiopeiæ from Star (d), *as given in Table V.*

No.	Date, 1887–8.			Equations of Condition.	Residuals.
		d.	h.	$''$	$''$
1	87 Oct.	22	10.3	$+0.367 = x + 0.0318\,\pi \quad - 0.1939\,d\mu$	+0.084
2		24	10.8	$.523 = x - .0035 \quad - .1884$	− .077
3		25	10.2	$.454 = x - .0202 \quad - .1856$	− .011
4	Nov.	14	9.8	$.321 = x - .3092 \quad - .1309$	+ .080
5		15	10.5	$.446 = x - .3260 \quad - .1281$	+ .046
6	88 Jan.	26	6.7	$+0.229 = x - 0.9840 \quad + 0.0692$	+0.077
7		28	6.4	$.172 = x - .9822 \quad + .0747$	+ .135
8	Feb.	1	6.9	$.306 = x - .9750 \quad + .0857$	+ .003
9		3	6.4	$.412 = x - .9697 \quad + .0913$	− .102
10		4	6.4	$.493 = x - .9665 \quad + .0939$	− .183
11	Apr.	11	13.9	$+0.513 = x - 0.1989 \quad + 0.2781$	−0.073
12		14	14.5	$.392 = x - .1478 \quad + .2863$	+ .056
13		26	13.2	$.527 = x + .0559 \quad + .3192$	− .045
14	May	3	13.2	$.603 = x + .1746 \quad + .3384$	− .102
15		4	13.5	$.513 = x + 0.1917 \quad + .3411$	− .009
16	Aug.	2	13.4	$+0.565 = x + 1.0069 \quad + 0.5874$	+0.080
17		3	13.9	$.729 = x + 1.0044 \quad + .5902$	− .085
18		6	12.9	$.493 = x + 0.9956 \quad + .5984$	+ .150
19		7	13.4	$.714 = x + .9922 \quad + .6011$	− .071
20		8	12.9	$.748 = x + .9883 \quad + .6038$	− .106
21	Oct.	19	12.1	$+0.522 = x + 0.1210 \quad + 0.8009$	−0.004
22		30	11.0	$.313 = x - .0675 \quad + .8310$	+ .176
23	Nov.	9	9.4	$.265 = x - .2383 \quad + .8584$	+ .215
24		13	10.3	$.538 = x - .3053 \quad + .8694$	− .084
25		17	10.6	$.492 = x - .3706 \quad + .8804$	− .048

Treating these equations in the usual method, the following normal equations result:—

$$\begin{aligned} +11.650 &= +25.0000\,x + 8.3720\,d\mu - 1.3023\,\pi \\ +4.4463 &= +8.3720 \quad +6.0450 \quad +1.9454 \\ +1.1330 &= -1.3023 \quad +1.9454 \quad +10.3753 \end{aligned}$$

whence, by solution, are obtained the following values of the unknowns, viz.—

$$\begin{aligned} x &= +0''.456 \\ d\mu &= +0.0531 \\ \pi &= +\mathbf{0.1565}. \end{aligned}$$

It further appears that the probable error of one complete measure of distance is $\pm 0''.106$, and that the probable error of π is $\pm 0''.0361$.

The collected results for the parallax of β Cassiopeiæ, gathered from the preceding pages, are as follows:—

Star's Name.	Mag.	Relative Annual Parallax.	Probable Error of Parallax.	Probable Error of one Complete Measure of Distance.
		″	″	″
D.M. + 58°, No. 1	9.2	+ 0.2004	± 0.0336	± 0.097
„ + 58°, No. 10	9.1	+ 0.1277	± 0.0374	± 0.106
„ + 58°, No. 8	8.3	+ 0.1313	± 0.0335	± 0.097
„ + 58°, No. 2700	9.2	+ 0.1565	± 0.0361	± 0.106

There appears to be an indication here that β Cassiopeiæ and the stars of comparison may possibly not belong to the same group. Possibly also the bright stars β and α are not closely associated. The parallax also is in accordance with the suggestions derived from the comparatively rapid proper motion of the star. I cannot find that the parallax of this star has been determined by any other astronomer.

PARALLAX OF γ CASSIOPEIÆ

Deduced from Observations at Critical Epochs.

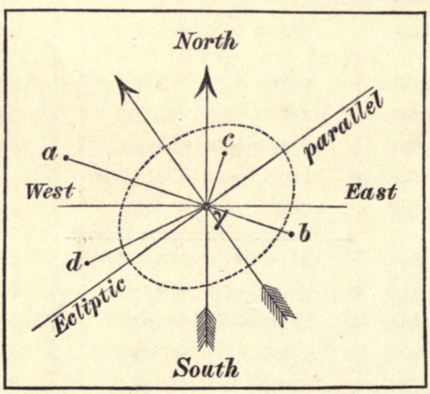
The stars selected for the determination of the relative parallax of γ Cassiopeiæ are—

Anonymous	...	Mag. 10.6	...	star (*a*)
D.M. + 59°, No. 158	...	„ 9.4	...	„ (*b*)
Anonymous	...	„ 10.3	...	„ (*c*)
D.M. + 59°, No. 137	...	„ 8.9	...	„ (*d*).

The approximate position-angles and distances of these four stars are—

$$\begin{array}{llll} \text{for star } a & \ldots & p = 288^\circ\ 6' & \ldots\ s = 1356'' \\ \text{,, } b & \ldots & = 108\ 47 & \ldots\ = 741 \\ \text{,, } c & \ldots & = 19\ \ 1 & \ldots\ = 464 \\ \text{,, } d & \ldots & = 245\ \ 5 & \ldots\ = 1221. \end{array}$$

The accompanying figure is a diagram, showing the relative position of these stars, with the form and position of the parallactic ellipse.



The parallactic factors in the equations of condition have been computed from the expressions—

$$\begin{array}{ll} \text{Star } (a) \ldots & ds = R\,[9.92691] \cos(\odot - \ \ 86^\circ\ \ 6') \\ \text{,, } \ (b) \ldots & ds = R\,[9.92540] \cos(\odot - 265\ 23) \\ \text{,, } \ (c) \ldots & ds = R\,[9.96688] \cos(\odot - 340\ \ \ 0) \\ \text{,, } \ (d) \ldots & ds = R\,[9.99639] \cos(\odot - 123\ 52). \end{array}$$

The proper motion of γ Cassiopeiæ, after consulting various authorities, has been assumed in

$$\text{R.A.} = +0^s.006$$
$$\text{Decl}^n. = -0''.025.$$

These preliminary facts will, with the information already afforded, permit the subsequent tables to be easily followed.

TABLE I.

Measures of the diagonal distances of Star (a) *from Star* (b) *and of Star* (c) *from Star* (d), *for the determination, at the times of exposure, of the correction to the measured distances from γ Cassiopeiæ.*

No. for Refer-ence.	Date of Exposure of Plate. 1887–8.	Measured Distance of (a) to (b) in Arc.	Correction for Refraction and Aberration.	Difference from Assumed Mean 2097″.30.	Measured Distance of (c) to (d) in Arc.	Correction for Refraction and Aberration.	Difference from Assumed Mean 1579″.50.
	d. h.	″	″	″	″	″	″
1	87 Aug. 20 11.1	2096.240	+0.948	+0.112	1578.948	+0.619	−0.067
2	24 12.9	96.160	.753	+ .387	78.696	.575	+ .229
3	25 12.2	96.940	.789	− .429	79.445	.588	− .533
4	31 12.6	96.295	.740	+ .265	78.761	.567	+ .172
5	Sept. 6 13.1	96.982	.711	− .393	79.375	.549	− .424
6	Dec. 6 8.0	2097.489	+0.525	−0.714	1579.720	+0.393	−0.613
7	7 7.2	96.489	.519	+ .292	79.088	.405	+ .007
8	16 6.8	97.303	.502	− .505	79.494	.390	− .384
9	18 8.2	96.632	.497	+ .171	78.807	.373	+ .320
10	23 7.4	96.823	.503	− .026	79.059	.365	+ .076
11	88 Feb. 5 6.7	2097.057	+0.568	−0.325	1579.309	+0.403	−0.212
12	15 6.8	96.254	.617	+ .429	78.434	.469	+ .597
13	16 6.9	96.389	.628	+ .283	78.488	.486	+ .526
14	Mar. 1 7.1	96.743	.702	− .145	78.833	.634	+ .033
15	8 7.1	97.259	0.747	− .706	79.387	.738	− .625
16	June 7 13.9	2096.403	+1.252	−0.355	1579.439	+0.574	−0.513
17	13 13.0	95.688	1.401	+ .211	78.592	.566	+ .342
18	14 12.8	95.714	1.443	+ .143	78.652	.565	+ .283
19	22 13.4	96.583	1.182	− .465	79.035	.594	− .129
20	30 13.3	95.402	1.111	+ .787	78.488	.608	+ .404
21	Aug. 14 12.0	2096.098	+0.877	+0.325	1578.357	+0.611	+0.532
22	15 11.2	6.363	.973	− .036	78.768	.621	+ .111
23	22 11.9	6.285	.822	+ .193	78.696	.598	+ .206
24	29 11.6	6.764	.810	− .274	79.079	.593	− .172
25	31 12.4	6.752	.745	− .197	79.234	.571	− .305

NOTES.

No. 2. One plate rejected, the film having received a slight injury.
No. 4. Images elliptical, but measurable.
No. 5. Exposure continued for eight minutes on account of fog.
No. 9. Exposure continued for ten minutes: sky hazy.
No. 13. One plate rejected owing to grossly discordant measures.
No. 14. Images elliptical: the driving-clock went badly.
No. 17. One plate rejected owing to discordant measures.
No. 19. Exposure continued for ten minutes: sky not transparent.
No. 24. Images elliptical, but measurable.

TABLE II.

Concluded measures of γ Cassiopeiæ from the comparison Stars (a) *and* (b).

No. for Reference.	Date of Exposure of Plate. 1887–8.			Measured Distance of Star (*a*) from γ Cassiopeiæ.	Sum of Corrections.	Concluded Distance of Star (*a*).	Measured Distance of Star (*b*) from γ Cassiopeiæ.	Sum of Corrections.	Concluded Distance of Star (*b*).
		d.	h.	″	″	″	″	″	″
1	87 Aug.	20	11.1	1355.615	+0.714	1356.329	740.874	+0.376	741.250
2		24	12.9	55.418	+ .746	56.164	40.919	+ .394	41.313
3		25	12.2	55.933	+ .240	56.173	41.304	+ .120	41.424
4		31	12.6	55.729	+ .656	56.385	40.741	+ .348	41.089
5	Sept.	6	13.1	55.992	+ .213	56.205	41.032	+ .104	41.136
6	Dec.	6	8.0	1356.500	−0.121	1356.379	741.441	−0.069	741.372
7		7	7.2	55.721	+ .526	56.247	41.219	+ .284	41.503
8		16	6.8	56.074	− .001	56.073	41.231	− .002	41.229
9		18	8.2	55.876	+ .450	56.326	41.142	+ .244	41.386
10		23	7.4	56.060	+ .305	56.365	41.308	+ .166	41.474
11	88 Feb.	5	6.7	1356.048	+0.150	1356.198	741.174	+0.088	741.262
12		15	6.8	55.727	+ .675	56.402	41.134	+ .371	41.505
13		16	6.9	55.736	+ .585	56.321	41.065	+ .326	41.391
14	Mar.	1	7.1	55.885	+ .358	56.243	41.177	+ .200	41.377
15		8	7.1	56.204	+ .071	56.275	41.183	+ .020	41.203
16	June	7	13.9	1355.837	+0.569	1356.406	740.855	+0.307	741.162
17		13	13.0	55.290	+1.032	56.322	40.734	+ .580	41.314
18		14	12.8	55.128	+1.015	56.143	40.791	+ .571	41.362
19		22	13.4	55.867	+0.452	56.319	41.029	+ .264	41.293
20		30	13.3	55.333	+0.892	56.225	40.922	+ .505	41.427
21	Aug.	14	12.0	1355.495	+0.762	1356.257	740.944	+0.439	741.383
22		15	11.2	55.541	+ .591	56.132	40.928	+ .345	41.273
23		22	11.9	55.541	+ .642	56.183	40.761	+ .373	41.134
24		29	11.6	56.005	+ .331	56.336	41.201	+ .204	41.405
25		31	12.4	56.036	+ .338	56.374	41.104	+ .209	41.313

TABLE III.

Equations of Condition formed from the concluded distances of γ Cassiopeiæ from Star (a), *as given in Table II.*

No.	Date, 1887–8.	d.	h.	Equations of Condition.	Residuals.
				$''$	$''$
1	87 Aug.	20	11.1	$+0.329 = x + 0.4085\,\pi - 0.3662\,d\mu$	−0.086
2		24	12.9	$.164 = x + .3557 - .3551$	+ .090
3		25	12.2	$.173 = x + .3429 - .3525$	+ .081
4		31	12.6	$.385 = x + .2616 - .3360$	− .132
5	Sept.	6	13.1	$.205 = x + .1775 - .3195$	+ .053
6	Dec.	6	8.0	$+0.379 = x - 0.8151 - 0.0709$	−0.098
7		7	7.2	$.247 = x - .8196 - .0683$	+ .034
8		16	6.8	$.073 = x - .8312 - .0437$	+ .215
9		18	8.2	$.326 = x - .8314 - .0381$	− .044
10		23	7.4	$.365 = x - .8270 - .0244$	− .082
11	88 Feb.	5	6.7	$+0.198 = x - 0.5318 + 0.0966$	+0.081
12		15	6.8	$.402 = x - .4114 + .1240$	− .124
13		16	6.9	$.321 = x - .3986 + .1265$	− .043
14	Mar.	1	7.1	$.243 = x - .2088 + .1651$	+ .033
15		8	7.1	$.275 = x - .1084 + .1842$	− .001
16	June	7	13.9	$+0.406 = x + 0.8488 + 0.4341$	−0.143
17		13	13.0	$.322 = x + .8577 + .4505$	− .059
18		14	12.8	$.143 = x + .8582 + .4533$	− .120
19		22	13.4	$.319 = x + .8545 + .4752$	− .055
20		30	13.3	$.225 = x + .8356 + .4971$	+ .040
21	Aug.	14	12.0	$+0.257 = x + 0.4732 + 0.6202$	+0.018
22		15	11.2	$.132 = x + .4613 + .6229$	+ .143
23		22	11.9	$.183 = x + .3727 + .6421$	+ .093
24		29	11.6	$.336 = x + .2793 + .6612$	− .057
25		31	12.4	$.374 = x + .2514 + .6667$	− .094

Treating these equations in the usual method, the following normal equations result:—

$$
\begin{aligned}
+6''.782 &= +25.0000\,x + 4.2450\,d\mu + 1.8556\,\pi \\
+1.1843 &= +\ \ 4.2450 \quad + 3.8515 \quad + 2.5908 \\
+0.3996 &= +\ \ 1.8556 \quad + 2.5908 \quad + 8.9171
\end{aligned}
$$

whence, by solution, are obtained the values of the unknowns, viz.—

$$
\begin{aligned}
x &= +0''.269 \\
d\mu &= +0.0235 \\
\pi &= -0.0179.
\end{aligned}
$$

It further appears that the probable error of one complete measure of distance is $\pm 0''.099$, and that the probable error of π is $\pm 0''.0375$.

TABLE IV.

Equations of Condition formed from the concluded distances of γ Cassiopeiæ from Star (b), *as given in Table II.*

No.	Date, 1887–8.	d.	h.	Equations of Condition.	Residuals.
				$''$	$''$
1	87 Aug.	20	11.1	$+0.250 = x - 0.3976\,\pi - 0.3662\,d\mu$	$+0.054$
2		24	12.9	$.313 = x - .3447 - .3551$	$-.005$
3		25	12.2	$.424 = x - .3320 - .3525$	$-.117$
4		31	12.6	$.089 = x - .2505 - .3360$	$+.223$
5	Sept.	6	13.1	$.136 = x - .1665 - .3195$	$+.180$
6	Dec.	6	8.0	$+0.372 = x + 0.8143 - 0.0709$	$+0.002$
7		7	7.2	$.503 = x + .8168 - .0683$	$-.130$
8		16	6.8	$.229 = x + .8285 - .0437$	$-.145$
9		18	8.2	$.386 = x + .8283 - .0381$	$-.012$
10		23	7.4	$.474 = x + .8230 - .0244$	$-.100$
11	88 Feb.	5	6.7	$+0.262 = x + 0.5220 + 0.0966$	$+0.093$
12		15	6.8	$.505 = x + .4009 + .1240$	$-.157$
13		16	6.9	$.391 = x + .3876 + .1265$	$-.044$
14	Mar.	1	7.1	$.377 = x + .1980 + .1651$	$-.041$
15		8	7.1	$.203 = x + .0978 + .1842$	$+.127$
16	June	7	13.9	$+0.162 = x - 0.8472 + 0.4341$	$+0.110$
17		13	13.0	$.314 = x - .8550 + .4505$	$-.042$
18		14	12.8	$.362 = x - .8555 + .4533$	$-.090$
19		22	13.4	$.293 = x - .8504 + .4752$	$-.022$
20		30	13.3	$.427 = x - .8300 + .4971$	$-.155$
21	Aug.	14	12.0	$+0.383 = x - 0.4626 + 0.6202$	-0.090
22		15	11.2	$.273 = x - .4507 + .6229$	$+.026$
23		22	11.9	$.134 = x - .3618 + .6421$	$+.165$
24		29	11.6	$.405 = x - .2683 + .6612$	$-.100$
25		31	12.4	$.313 = x - .2403 + .6667$	$-.007$

Treating these equations in the usual method, the following normal equations result:—

$$\begin{array}{rcllll}
+7.''980 & = & +25.0000\,x & +4.2450\,d\mu & -1.7939\,\pi \\
+1.1978 & = & +\ \ 4.2450 & +3.8515 & -2.5741 \\
-0.0458 & = & -\ \ 1.7939 & -2.5741 & +8.7606
\end{array}$$

whence, by solution, are obtained the values of the unknowns, viz.—

$$\begin{aligned}
x &= +0.''325 \\
d\mu &= -0.0074 \\
\pi &= +0.0591.
\end{aligned}$$

It further appears that the probable error of one complete measure of distance is $\pm 0''.115$, and that the probable error of π is $\pm 0.''0436$.

PARALLAX OF γ CASSIOPEIÆ, RELATIVELY TO STARS (C) AND (D).

TABLE V.

Concluded measures of γ Cassiopeiæ from the comparison Stars (c) *and* (d).

No. for Reference.	Date of Exposure of Plate. 1887–8.	Measured Distance of Star (*c*) from γ Cassiopeiæ.	Sum of Corrections.	Concluded Distance of Star (*c*).	Measured Distance of Star (*d*) from γ Cassiopeiæ.	Sum of Corrections.	Concluded Distance of Star (*d*).
	d. h.	″	″	″	″	″	″
1	87 Aug. 20 11.1	464.435	+0.140	464.575	1220.481	+0.455	1220.936
2	24 12.9	64.578	+ .235	64.813	20.459	+ .655	21.114
3	25 12.2	64.732	+ .010	64.742	21.016	+ .046	21.062
4	31 12.6	64.393	+ .220	64.613	20.425	+ .578	21.003
5	Sept. 6 13.1	64.659	+ .038	64.697	20.804	+ .093	20.897
6	Dec. 6 8.0	464.603	−0.003	464.600	1221.170	−0.166	1221.004
7	7 7.2	64.413	+ .119	64.532	20.650	+ .312	20.962
8	16 6.8	64.764	.000	64.764	21.204	− .001	21.203
9	18 8.2	64.535	+ .204	64.739	20.475	+ .537	21.012
10	23 7.4	64.757	+ .130	64.887	20.729	+ .346	21.075
11	88 Feb. 5 6.7	464.806	+0.030	464.836	1220.747	+0.136	1220.883
12	15 6.8	64.526	+ .286	64.812	20.188	+ .837	21.025
13	16 6.9	64.436	+ .269	64.705	20.405	+ .798	21.203
14	Mar. 1 7.1	64.493	+ .140	64.633	20.535	+ .529	21.064
15	8 7.1	64.728	− .019	64.709	21.003	+ .106	21.109
16	June 7 13.9	464.769	−0.004	464.765	1221.128	+0.102	1221.230
17	13 13.0	64.333	+ .258	64.591	20.157	+ .765	20.922
18	14 12.8	64.580	+ .242	64.822	20.217	+ .721	20.938
19	22 13.4	64.475	+ .108	64.583	20.715	+ .412	21.127
20	30 13.3	64.502	+ .268	64.770	20.267	+ .826	21.093
21	Aug. 14 12.0	464.397	+0.310	464.707	1220.165	+0.899	1221.064
22	15 11.2	64.437	+ .185	64.622	20.381	+ .592	20.973
23	22 11.9	64.316	+ .213	64.529	20.362	+ .630	20.992
24	29 11.6	64.643	+ .100	64.743	20.641	+ .333	20.974
25	31 12.4	64.574	+ .061	64.635	20.668	+ .215	20.883

TABLE VI.

Equations of Condition formed from the concluded distances of γ Cassiopeiæ from Star (c), as given in Table V.

No.	Date, 1887–8.			Equations of Condition.	Residuals.
		d.	h.	″	″
1	87 Aug.	20	11.1	$+0.075 = x - 0.9152\,\pi - 0.3662\,d\mu$	+0.104
2		24	12.9	$.313 = x - .9260 \quad - .3551$	− .134
3		25	12.2	$.242 = x - .9279 \quad - .3525$	− .063
4		31	12.6	$.113 = x - .9343 \quad - .3360$	+ .066
5	Sept.	6	13.1	$.197 = x - .9311 \quad - .3195$	− .019
6	Dec.	6	8.0	$+0.100 = x + 0.0706 \quad - 0.0709$	+0.114
7		7	7.2	$.032 = x + .0861 \quad - .0683$	+ .182
8		16	6.8	$.264 = x + .2291 \quad - .0437$	− .045
9		18	8.2	$.239 = x + .2612 \quad - .0381$	− .019
10		23	7.4	$.387 = x + .3372 \quad - .0244$	− .163
11	88 Feb.	5	6.7	$+0.336 = x + 0.8377 \quad + 0.0966$	−0.095
12		15	6.8	$.312 = x + .8906 \quad + .1240$	− .070
13		16	6.9	$.205 = x + .8945 \quad + .1265$	+ .037
14	Mar.	1	7.1	$.133 = x + .9192 \quad + .1651$	+ .109
15		8	7.1	$.209 = x + .9101 \quad + .1842$	+ .033
16	June	7	13.9	$+0.265 = x - 0.1253 \quad + 0.4341$	−0.071
17		13	13.0	$.091 = x - .2174 \quad + .4505$	+ .099
18		14	12.8	$.322 = x - .2326 \quad + .4533$	− .133
19		22	13.4	$.083 = x - .3520 \quad + .4752$	+ .101
20		30	13.3	$.270 = x - .4652 \quad + .4971$	− .092
21	Aug.	14	12.0	$+0.207 = x - 0.8950 \quad + 0.6202$	−0.048
22		15	11.2	$.122 = x - .8993 \quad + .6229$	+ .036
23		22	11.9	$.029 = x - .9232 \quad + .6421$	+ .127
24		29	11.6	$.243 = x - .9339 \quad + .6612$	− .087
25		31	12.4	$.135 = x - .9345 \quad + .6667$	+ .021

Treating these equations in the usual method, the following normal equations result:—

$$\begin{aligned} +4''.924 &= +25.0000\,x + 4.2450\,d\mu - 5.1766\,\pi \\ +0.7427 &= +4.2450 \quad + 3.8115 \quad - 1.4176 \\ -0.5110 &= -5.1766 \quad - 1.4176 \quad + 13.1758 \end{aligned}$$

whence, by solution, are obtained the values of the unknowns, viz.—

$$\begin{aligned} x &= +0''.209 \\ d\mu &= -0.0228 \\ \pi &= +0.0410. \end{aligned}$$

It further appears that the probable error of one complete measure of distance is $\pm 0''.100$, and that the probable error of π is $\pm 0''.0289$.

TABLE VII.

Equations of Condition formed from the concluded distances of γ Cassiopeiæ from Star (d), *as given in Table V.*

No.	Date, 1887–8. d. h.	Equations of Condition.			Residuals.
		″			″
1	87 Aug. 20 11.1	$+0.136 = x$	$+0.9185\,\pi$	$-0.3662\,d\mu$	$+0.069$
2	24 12.9	$.314 = x$	$+\ .8880$	$-\ .3551$	$-\ .108$
3	25 12.2	$.262 = x$	$+\ .8801$	$-\ .3525$	$-\ .056$
4	31 12.6	$.203 = x$	$+\ .8259$	$-\ .3360$	$+\ .004$
5	Sept. 6 13.1	$.097 = x$	$+\ .7639$	$-\ .3195$	$+\ .112$
6	Dec. 6 8.0	$+0.204 = x$	-0.6352	-0.0709	$+0.047$
7	7 7.2	$.162 = x$	$-\ .6477$	$-\ .0683$	$+\ .089$
8	16 6.8	$.403 = x$	$-\ .7551$	$-\ .0437$	$-\ .148$
9	18 8.2	$.212 = x$	$-\ .7775$	$-\ .0381$	$+\ .043$
10	23 7.4	$.275 = x$	$-\ .8258$	$-\ .0244$	$-\ .019$
11	88 Feb. 5 6.7	$+0.083 = x$	-0.9546	$+0.0966$	$+0.176$
12	15 6.8	$.225 = x$	$-\ .9039$	$+\ .1240$	$+\ .033$
13	16 6.9	$.403 = x$	$-\ .8972$	$+\ .1265$	$-\ .146$
14	Mar. 1 7.1	$.264 = x$	$-\ .7770$	$+\ .1651$	$-\ .012$
15	8 7.1	$.309 = x$	$-\ .7153$	$+\ .1842$	$-\ .058$
16	June 7 13.9	$+0.430 = x$	$+0.6968$	$+0.4341$	-0.226
17	13 13.0	$.122 = x$	$+\ .7659$	$+\ .4505$	$+\ .079$
18	14 12.8	$.138 = x$	$+\ .7767$	$+\ .4533$	$+\ .062$
19	22 13.4	$.327 = x$	$+\ .8557$	$+\ .4752$	$-\ .129$
20	30 13.3	$.293 = x$	$+\ .9192$	$+\ .4971$	$-\ .097$
21	Aug. 14 12.0	$+0.264 = x$	$+0.9512$	$+0.6202$	-0.070
22	15 11.2	$.173 = x$	$+\ .9458$	$+\ .6229$	$+\ .021$
23	22 11.9	$.192 = x$	$+\ .8978$	$+\ .6421$	$+\ .004$
24	29 11.6	$.174 = x$	$+\ .8383$	$+\ .6612$	$+\ .023$
25	31 12.4	$.083 = x$	$+\ .8187$	$+\ .6667$	$+\ .114$

Treating these equations in the usual method, the following normal equations result:—

$$\begin{aligned} +5\overset{''}{.}548 &= +25.0000\,x + 4.2450\,d\mu + 4.8532\,\pi \\ +0.8468 &= +\ \ 4.2450 \quad + 3.8515 \quad + \ \ 2.8325 \\ +0.5407 &= +\ \ 4.8532 \quad + 2.8325 \quad + 17.3314 \end{aligned}$$

whence, by solution, are obtained the values of the unknowns, viz.—

$$\begin{aligned} x &= +0\overset{''}{.}230 \\ d\mu &= -0.0102 \\ \pi &= -0.0315. \end{aligned}$$

It further appears that the probable error of one complete measure of distance is $\pm 0''.102$, and that the probable error of π is $\pm 0''.0263$.

The collected results for the parallax of γ Cassiopeiæ, gathered from the preceding pages, are as follows:—

Star's Name.	Mag.	Relative Annual Parallax.	Probable Error of Parallax.	Probable Error of one Complete Measure of Distance.
		"	"	"
Anonymous	10.6	−0.0179	±0.0375	±0.099
D.M. + 59°, No. 158	9.4	+0.0591	±0.0436	±0.115
Anonymous	10.3	+0.0410	±0.0289	±0.100
D.M. + 59°, No. 137	8.9	−0.0315	±0.0263	±0.102

This is the first instance of a negative parallax met with in these researches. Its smallness of amount, notwithstanding its algebraic significance, seems to indicate that the principal star, and the faint stars of comparison are in the same group, although no conclusion can be deduced therefrom as to the comparative remoteness or proximity of the group itself in relation to the Solar System. The brightness, however, of the principal star would in itself indicate a probable proximity. Apart from such considerations, the nature of its bright-lined spectrum points to a constitution quite different from that of other stars in this constellation; this peculiarity of spectrum, according to Mr. Lockyer's hypothesis, may indicate an as yet unformed condition of the star. The variability also of this spectrum is in accordance with the hypothesis of meteoric collisions in the star, whether periodic or irregular. In making this remark it is not to be understood that I am here adopting, without reserve, the bold and ingenious hypothesis of Mr. Lockyer; nor, on the other hand, do I desire to express a doubt of its legitimacy. I cannot find any determination of the parallax of this star by other astronomers.

PARALLAX OF α CEPHEI

Deduced from Observations at Critical Epochs.

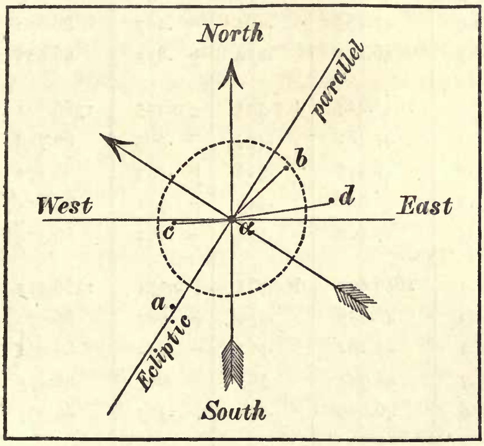
The stars selected for the determination of the relative parallax of α Cephei are—

D.M. + 61°, No. 2106	...	Magnitude	9.1	...	Star	*a*
D.M. + 62°, No. 1926	...	"	9.3	...	"	*b*
D.M. + 61°, No. 2107	...	"	9.0	...	"	*c*
D.M. + 62°, No. 1927	...	"	9.1	...	"	*d*.

The approximate position-angles and distances of these four stars are—

$$\begin{array}{lllcl} \text{for star } (a) & \ldots & p = 211^\circ\ 22' & \ldots & s = 989'' \\ \quad\text{"}\quad (b) & \ldots & \quad = 47\ \ 9 & \ldots & \quad = 672 \\ \quad\text{"}\quad (c) & \ldots & \quad = 267\ 25 & \ldots & \quad = 511 \\ \quad\text{"}\quad (d) & \ldots & \quad = 81\ 16 & \ldots & \quad = 878. \end{array}$$

The accompanying figure is a diagram showing the relative position of these stars, with the form and position of the parallactic ellipse.



The parallactic factors in the equations of condition have been computed from the expressions—

$$\begin{array}{ll} \text{Star } (a) \ldots & ds = R\,[9.99999] \cos(\odot - 103^\circ\ 10') \\ \quad\text{"}\quad (b) \ldots & ds = R\,[9.99843] \cos(\odot - 268\ \ 25) \\ \quad\text{"}\quad (c) \ldots & ds = R\,[9.98087] \cos(\odot - \ \ 49\ \ 20) \\ \quad\text{"}\quad (d) \ldots & ds = R\,[9.98400] \cos(\odot - 235\ \ 23). \end{array}$$

The proper motion of α Cephei, after consulting various authorities, has been assumed, in—

$$\begin{array}{ll} \text{R.A.} & +0^s.0218 \\ \text{Decl}^n. & +0''.035. \end{array}$$

These preliminary facts will, with the information already afforded, permit the subsequent tables to be easily followed.

TABLE I.

Measures of the diagonal distances of Star (a) *from Star* (b), *and of Star* (c) *from Star* (d), *for the determination, at the times of exposure, of the correction to their measured distances from α Cephei.*

No. for Reference.	Date of Exposure of Plate. 1887–8.			Measured Distance of (a) to (b) in Arc.	Correction for Refraction and Aberration.	Difference from Assumed Mean 1647″.50.	Measured Distance of (c) to (d) in Arc.	Correction for Refraction and Aberration.	Difference from Assumed Mean 1387″.10.
		d.	h.	″	″	″	″	″	″
1	87 Nov.	14	8.1	1647.093	+0.436	−0.029	1386.375	+0.412	+0.313
2		15	6.8	47.426	.421	− .347	86.994	.368	− .262
3		17	7.3	46.463	.424	+ .613	86.210	.385	+ .505
4		23	6.8	47.365	.420	− .285	86.851	.379	− .130
5		24	7.1	47.220	.422	− .142	86.679	.392	+ .029
6	Dec.	6	6.9	1646.691	+0.434	+0.375	1386.214	+0.412	+0.474
7		7	7.0	46.561	.436	+ .503	85.971	.420	+ .709
8		15	7.5	46.861	.499	+ .140	86.303	.489	+ .308
9		16	6.9	47.233	.474	− .207	86.650	.447	+ .003
10		23	6.7	46.211	.474	+ .815	86.006	.469	+ .625
11	88 May	3	12.6	1647.424	+0.501	−0.425	1386.721	+0.671	−0.292
12		4	11.4	47.281	.494	− .275	86.718	.695	− .313
13		8	12.0	46.455	.501	+ .544	86.172	.684	+ .244
14		10	12.2	46.668	.511	+ .321	86.153	.672	+ .275
15		12	11.3	47.260	.502	− .262	86.374	.696	− .030
16	June	30	12.1	1646.824	+0.565	+0.111	1386.572	+0.541	−0.013
17	July	3	10.3	46.858	.559	+ .083	86.570	.592	− .062
18		5	12.1	47.181	.561	− .242	86.962	.493	− .355
19		9	11.7	46.944	.563	− .007	86.475	.496	+ .129
20		12	9.6	46.629	.558	+ .313	86.337	.501	+ .262
21	Nov.	9	8.7	1647.101	+0.452	−0.053	1386.970	+0.434	−0.304
22		13	7.3	46.908	.445	+ .147	86.685	.424	− .009
23		16	9.3	47.187	.515	− .202	86.816	.503	− .219
24		20	8.6	47.334	.474	− .308	86.711	.463	− .074
25		21	8.9	46.734	.501	+ .265	86.207	.492	+ .401

NOTES.

No. 4. The exposure continued for ten minutes owing to haze.
No. 5. The images elliptical, but measurable.
No. 9. One of the plates rejected: the measures being grossly discordant.
No. 11. Clouds passing: the exposures of somewhat uncertain length.
No. 17. Clouds passing: the exposures sometimes interrupted.
No. 20. Images elliptical, but measurable.
No. 24. Exposure continued for eight minutes: the images of the comparison stars very faint.

TABLE II.

Concluded measures of α Cephei, from the comparison Stars (a) *and* (b).

No. for Reference.	Date of Exposure of Plate. 1887–8.			Measured Distance of Star (*a*) from α Cephei.	Sum of Corrections.	Concluded Distance of Star (*a*).	Measured Distance of Star (*b*) from α Cephei.	Sum of Corrections.	Concluded Distance of Star (*b*).
		d.	h.	"	"	"	"	"	"
1	87 Nov.	14	8.1	989.377	+0.255	989.632	672.555	+0.152	672.707
2		15	6.8	89.549	.158	89.707	72.619	.014	72.633
3		17	7.3	88.869	.635	89.504	72.336	.406	72.742
4		23	6.8	89.503	.090	89.593	72.875	.040	72.915
5		24	7.1	89.609	.177	89.786	72.613	.104	72.717
6	Dec.	6	6.9	989.159	+0.483	989.642	672.491	+0.324	672.815
7		7	7.0	88.964	.565	89.529	72.448	.379	72.827
8		15	7.5	89.454	.373	89.827	72.429	.264	72.693
9		16	6.9	89.596	.146	89.742	72.801	.105	72.906
10		23	6.7	88.863	.768	89.631	72.259	.533	72.792
11	88 May	3	12.6	989.761	+0.004	989.765	672.486	+0.092	672.578
12		4	11.4	89.780	.103	89.883	72.442	.200	72.642
13		8	12.0	89.207	.587	89.794	72.241	.486	72.727
14		10	12.2	89.144	.455	89.599	72.191	.402	72.593
15		12	11.3	89.772	.105	89.877	72.659	.157	72.816
16	June	30	12.1	989.568	+0.346	989.914	672.390	+0.352	672.742
17	July	3	10.3	89.383	.322	89.705	72.295	.344	72.639
18		5	12.1	89.093	.534	89.627	72.699	.193	72.892
19		9	11.7	89.611	.272	89.883	72.425	.302	72.727
20		12	9.6	89.442	.433	89.875	72.224	.441	72.665
21	Nov.	9	8.7	989.621	+0.141	989.762	672.454	+0.286	672.740
22		13	7.3	89.263	+.256	89.519	72.227	.366	72.593
23		16	9.3	89.661	+.086	89.747	72.628	.257	72.885
24		20	8.6	89.726	−.006	89.720	72.419	.197	72.616
25		21	8.9	89.261	+.352	89.613	72.427	.445	72.872

TABLE III.

Equations of Condition formed from the concluded distances of α Cephei from Star (a), *as given in Table II.*

No.	Date, 1887–8.			Equations of Condition.	Residuals.
		d.	h.	″	″
1	87 Nov.	14	8.1	$+0.132 = x - 0.6224\pi - 0.1312\,d\mu$	+0.032
2		15	6.8	$.207 = x - .6347 - .1284$	− .044
3		17	7.3	$.004 = x - .6611 - .1230$	+ .158
4		23	6.8	$.093 = x - .7338 - .1065$	+ .063
5		24	7.1	$.286 = x - .7454 - .1038$	− .130
6	Dec.	6	6.9	$+0.142 = x - 0.8632 - 0.0710$	+0.006
7		7	7.0	$.029 = x - .8714 - .0683$	+ .119
8		15	7.5	$.327 = x - .9270 - .0464$	− .183
9		16	6.9	$.242 = x - .9324 - .0437$	− .098
10		23	6.7	$.131 = x - .9636 - .0245$	+ .012
11	88 May	3	12.6	$+0.265 = x + 0.5164 + 0.3382$	0.000
12		4	11.4	$.383 = x + .5304 + .3409$	− .117
13		8	12.0	$.294 = x + .5880 + .3518$	− .024
14		10	12.2	$.099 = x + .6157 + .3573$	+ .173
15		12	11.3	$.377 = x + .6422 + .3628$	− .103
16	June	30	12.1	$+0.414 = x + 1.0146 + 0.4970$	−0.107
17	July	3	10.3	$.205 = x + 1.0167 + .5050$	+ .102
18		5	12.1	$.127 = x + 1.0165 + .5107$	+ .180
19		9	11.7	$.383 = x + 1.0144 + .5215$	− .076
20		12	9.6	$.375 = x + 1.0074 + .5295$	− .069
21	Nov.	9	8.7	$+0.262 = x - 0.5642 + 0.8580$	−0.057
22		13	7.3	$.019 = x - .6049 + .8688$	+ .183
23		16	9.3	$.247 = x - .6590 + .8770$	− .049
24		20	8.6	$.220 = x - .7083 + .8880$	− .025
25		21	8.9	$.113 = x - .7205 + .8907$	+ .082

Treating these equations in the usual method, the following normal equations result:—

$$\begin{aligned} +5''.376 &= +25.0000\,x + 7.3504\,d\mu - 3.2496\,\pi \\ +1.8970 &= +7.3504 \quad + 5.8561 \quad + 1.3849 \\ +0.4798 &= -3.2496 \quad + 1.3849 \quad + 15.4480 \end{aligned}$$

whence, by solution, are obtained the values of the unknowns, viz.—

$$x = +0''.214$$
$$d\mu = +0.0373$$
$$\pi = +0.0729.$$

It further appears that the probable error of one complete measure of distance is $\pm 0''.113$, and that the probable error of π is $\pm 0''.0309$.

TABLE IV.

Equations of Condition formed from the concluded distances of a Cephei from Star (b), *as given in Table II.*

No.	Date, 1887–8.			Equations of Condition.	Residuals.
		d.	h.	″	″
1	87 Nov.	14	8.1	$+0.207 = x + 0.7974\,\pi - 0.1312\,d\mu$	+0.048
2		15	6.8	$.133 = x + .8067 - .1284$	+ .122
3		17	7.3	$.242 = x + .8260 - .1230$	+ .014
4		23	6.8	$.415 = x + .8778 - .1065$	− .157
5		24	7.1	$.217 = x + .8851 - .1038$	+ .041
6	Dec.	6	6.9	$+0.315 = x + 0.9552 - 0.0710$	−0.054
7		7	7.0	$.327 = x + .9590 - .0683$	− .065
8		15	7.5	$.193 = x + .9802 - .0464$	+ .069
9		16	6.9	$.406 = x + .9811 - .0437$	− .144
10		23	6.7	$.292 = x + .9813 - .0245$	− .029
11	88 May	3	12.6	$+0.078 = x - 0.7199 + 0.3382$	+0.128
12		4	11.4	$.142 = x - .7313 + .3409$	+ .064
13		8	12.0	$.227 = x - .7777 + .3518$	− .023
14		10	12.2	$.093 = x - .7993 + .3573$	+ .111
15		12	11.3	$.316 = x - .8198 + .3628$	− .112
16	June	30	12.1	$+0.242 = x - 0.9972 + 0.4970$	−0.043
17	July	3	10.3	$.139 = x - .9865 + .5050$	+ .061
18		5	12.1	$.392 = x - .9784 + .5107$	− .192
19		9	11.7	$.227 = x - .9625 + .5215$	− .027
20		12	9.6	$.165 = x - .9389 + .5295$	+ .037
21	Nov.	9	8.7	$+0.240 = x + 0.7508 + 0.8580$	+0.031
22		13	7.3	$.093 = x + .7943 + .8688$	+ .179
23		16	9.3	$.385 = x + .8245 + .8770$	− .111
24		20	8.6	$.116 = x + .8598 + .8880$	+ .159
25		21	8.9	$.372 = x + .8684 + .8907$	− .097

Treating these equations in the usual method, the following normal equations result:—

$$
\begin{aligned}
+\overset{\prime\prime}{5}.974 &= +25.0000\,x + 7.3504\,d\mu + 4.4358\,\pi \\
+1.7383 &= +\ \ 7.3504 \quad + 5.8561 \quad - 0.9886 \\
+1.7051 &= +\ \ 4.4358 \quad - 0.9886 \quad + 19.3107
\end{aligned}
$$

whence, by solution, are obtained the values of the unknowns, viz.—

$$
\begin{aligned}
x &= +\overset{\prime\prime}{0}.227 \\
d\mu &= +0.0181 \\
\pi &= +0.0371.
\end{aligned}
$$

It further appears that the probable error of one complete measure of distance is $\pm 0''.106$, and that the probable error of π is $\pm 0''.0256$.

PARALLAX OF α CEPHEI, RELATIVELY TO STARS (C) *AND* (D).

TABLE V.

Concluded measures of α Cephei, from the comparison Stars (c) *and* (d).

No. for Reference.	Date of Exposure of Plate. 1887–8.			Measured Distance of Star (*c*) from α Cephei.	Sum of Corrections.	Concluded Distance of Star (*c*).	Measured Distance of Star (*d*) from α Cephei.	Sum of Corrections.	Concluded Distance of Star (*d*).
		d.	h.	″	″	″	″	″	″
1	87 Nov.	14	8.1	510.815	+ 0.290	511.105	877.677	+ 0.436	878.113
2		15	6.8	10.843	+ .060	10.903	78.055	.045	78.100
3		17	7.3	10.654	+ .350	11.004	77.360	.543	77.903
4		23	6.8	10.783	+ .109	10.892	78.046	.139	78.185
5		24	7.1	10.945	+ .173	11.118	77.987	.212	78.199
6	Dec.	6	6.9	510.722	+ 0.340	511.062	877.509	+ 0.553	878.062
7		7	7.0	10.518	+ .429	10.947	77.614	.699	78.313
8		15	7.5	10.846	+ .301	11.147	77.516	.497	78.013
9		16	6.9	10.844	+ .174	11.018	77.815	.277	78.092
10		23	6.7	10.678	+ .412	11.090	77.485	.689	78.174
11	88 May	3	12.6	511.014	+ 0.099	511.113	877.701	+ 0.282	877.983
12		4	11.4	10.752	+ .102	10.854	77.766	.281	78.047
13		8	12.0	10.740	+ .302	11.042	77.359	.633	77.992
14		10	12.2	10.867	+ .305	11.172	77.363	.646	78.009
15		12	11.3	10.811	+ .202	11.013	77.398	.467	77.865
16	June	30	12.1	511.063	+ 0.119	511.182	877.524	+ 0.414	877.938
17	July	3	10.3	10.931	+ .122	11.053	77.695	.412	78.107
18		5	12.1	10.995	— .028	10.967	77.842	.167	78.009
19		9	11.7	11.045	+ .152	11.197	77.689	.479	78.168
20		12	9.6	10.864	+ .241	11.105	77.222	.627	77.849
21	Nov.	9	8.7	511.111	— 0.084	511.027	878.003	+ 0.216	878.219
22		13	7.3	11.093	+ .020	11.113	77.693	.399	78.092
23		16	9.3	10.915	— .032	10.883	77.864	.315	78.179
24		20	8.6	11.004	+ .005	11.009	77.889	.386	78.275
25		21	8.9	10.928	+ .194	11.122	77.400	.705	78.105

TABLE VI.

Equations of Condition formed from the concluded distances of α Cephei from Star (c), *as given in Table V.*

No.	Date, 1887–8.			Equations of Condition.				Residuals.
		d.	h.	″				″
1	87 Nov.	14	8.1	+0.305	= x	−0.9452 π	−0.1312 $d\mu$	−0.080
2		15	6.8	.103	= x	− .9441	− .1284	+ .122
3		17	7.3	.204	= x	− .9408	− .1230	+ .020
4		23	6.8	.092	= x	− .9243	− .1065	+ .132
5		24	7.1	.318	= x	− .9204	− .1038	− .094
6	Dec.	6	6.9	+0.262	= x	−0.8539	−0.0710	−0.039
7		7	7.0	.147	= x	− .8464	− .0683	+ .077
8		15	7.5	.347	= x	− .7786	− .0464	− .124
9		16	6.9	.218	= x	− .7690	− .0437	+ .005
10		23	6.7	.290	= x	− .6955	− .0245	− .067
11	88 May	3	12.6	+0.313	= x	+0.9614	+0.3382	−0.044
12		4	11.4	.054	= x	+ .9629	+ .3409	+ .215
13		8	12.0	.242	= x	+ .9667	+ .3518	+ .027
14		10	12.2	.372	= x	+ .9670	+ .3573	− .103
15		12	11.3	.213	= x	+ .9661	+ .3628	+ .057
16	June	30	12.1	+0.382	= x	+0.6229	+0.4970	−0.111
17	July	3	10.3	.253	= x	+ .5857	+ .5050	+ .017
18		5	12.1	.167	= x	+ .5587	+ .5107	+ .103
19		9	11.7	.397	= x	+ .5184	+ .5215	− .128
20		12	9.6	.305	= x	+ .4637	+ .5295	− .036
21	Nov.	9	8.7	+0.227	= x	−0.9469	+0.8580	+0.035
22		13	7.3	.313	= x	− .9454	+ .8688	− .051
23		16	9.3	.083	= x	− .9410	+ .8770	+ .180
24		20	8.6	.209	= x	− .9315	+ .8880	+ .054
25		21	8.9	.322	= x	− .9283	+ .8907	− .058

Treating these equations in the usual method, the following normal equations result:—

$$\begin{aligned}
+6''.138 &= +25.0000\,x + 7.3504\,d\mu - 5.7378\,\pi \\
+2.0207 &= +\ \ 7.3504 \quad +5.8561 \quad -\ 0.2567 \\
-1.0462 &= -\ \ 5.7378 \quad -0.2567 \quad +18.0845
\end{aligned}$$

whence, by solution, are obtained the values of the unknowns, viz.—

$$\begin{aligned}
x &= +0''.234 \\
d\mu &= +0.0518 \\
\pi &= +0.0172.
\end{aligned}$$

It further appears that the probable error of one complete measure of distance is $\pm 0''.100$, and that the probable error of π is $\pm 0''.0249$.

TABLE VII.

Equations of Condition formed from the measures of α Cephei and Star (d), *as given in Table V.*

No.	Date, 1887–8.			Equations of Condition.	Residuals.
		d.	h.	$''$	$''$
1	87 Nov.	14	8.1	$+0.313 = x + 0.9515\pi - 0.1312\,d\mu$	+0.031
2		15	6.8	$.300 = x + .9521 - .1284$	+ .044
3		17	7.3	$.103 = x + .9524 - .1230$	+ .242
4		23	6.8	$.385 = x + .9465 - .1065$	− .041
5		24	7.1	$.399 = x + .9442 - .1038$	− .054
6	Dec.	6	6.9	$+0.262 = x + 0.9059 - 0.0710$	+0.081
7		7	7.0	$.513 = x + .8917 - .0683$	− .171
8		15	7.5	$.213 = x + .8360 - .0464$	+ .123
9		16	6.9	$.292 = x + .8279 - .0437$	+ .044
10		23	6.7	$.374 = x + .7639 - .0245$	− .044
11	88 May	3	12.6	$+0.183 = x - 0.9532 + 0.3382$	−0.028
12		4	11.4	$.247 = x - .9563 + .3409$	− .093
13		8	12.0	$.192 = x - .9672 + .3518$	− .039
14		10	12.2	$.209 = x - .9710 + .3573$	− .056
15		12	11.3	$.065 = x - .9734 + .3628$	+ .088
16	June	30	12.1	$+0.138 = x - 0.7030 + 0.4970$	+0.058
17	July	3	10.3	$.307 = x - .6691 + .5050$	− .106
18		5	12.1	$.209 = x - .6441 + .5107$	− .004
19		9	11.7	$.368 = x - .6067 + .5215$	− .158
20		12	9.6	$.049 = x - .5551 + .5295$	+ .158
21	Nov.	9	8.7	$+0.419 = x + 0.9458 + 0.8580$	+0.003
22		13	7.3	$.292 = x + .9513 + .8688$	+ .130
23		16	9.3	$.379 = x + .9524 + .8770$	+ .044
24		20	8.6	$.475 = x + .9497 + .8880$	− .051
25		21	8.9	$.305 = x + .9484 + .8907$	+ .119

Treating these equations in the usual method, the following normal equations result:—

$$\begin{aligned} +6''.983 &= +25.0000x + 7.3504\,d\mu + 3.1746\pi \\ +2.2348 &= +\ 7.3504 + 5.8501 + 0.0182 \\ +3.0530 &= +\ 3.1746 + 0.0182 + 19.2716 \end{aligned}$$

whence, by solution, are obtained the values of the unknowns, viz.—

$$\begin{aligned} x &= +0''.241 \\ d\mu &= +0.0785 \\ \pi &= +\mathbf{0.1186}. \end{aligned}$$

It further appears that the probable error of one complete measure of distance is $\pm 0''.104$, and that the probable error of π is $\pm 0''.0274$.

The collected results for the parallax of α Cephei, gathered from the preceding pages, are as follows:—

Star's Name.	Mag.	Relative Annual Parallax.	Probable Error of Parallax.	Probable Error of one Complete Measure of Distance.
		″	″	″
D.M. +61°, No. 2106	9.1	+0.0729	±0.0309	±0.113
„ +62°, „ 1926	9.3	+0.0371	±0.0256	±0.106
„ +61°, „ 2107	9.0	+0.0172	±0.0249	±0.100
„ +62°, „ 1927	9.1	+0.1186	±0.0274	±0.104

The comparatively great difference of one-tenth of a second between the relative parallaxes of this star in respect of the faint stars of comparison (*c*) and (*d*), is very observable, and is even more marked than in the case of Polaris, to which reference has already been made. And yet the brightness of these comparatively faint stars is approximately the same. Moreover, the determination of a parallax of one-tenth of a second is far within the capabilities of these researches. It will therefore be a question of interest to ascertain whether the relative parallaxes of the stars (*c*) and (*d*) cannot be determined by a direct method. The proper motion of α Cephei calls for no particular remark, nor can I find any other determination of its parallax.

Here arises once more the suggestion of an enquiry already partially applied to 61 Cygni, viz. as to the effect of a greater or less number of sets of observations on the concluded parallax of a star. Accordingly, I made an additional set of measures of distance during the month of July last, at which time the co-efficient of parallax for the stars (*a*) and (*b*) is influential.

The addition of this set of five nights in July last, leads to the following normal equations, based on the whole thirty nights: viz. six sets of five nights each:—

For the Star (a).

$$\begin{aligned} +6''.916 &= +30.0000x + 14.9756\,d\mu + 1.7859\,\pi \\ +4.2466 &= +14.9756 \quad +17.4854 \quad + 9.0505 \\ +2.0345 &= +\ 1.7859 \quad +\ 9.0505 \quad +20.5197. \end{aligned}$$

For the Star (b).

$$\begin{aligned} +7''.117 &= +30.0000x + 14.9756\,d\mu - 0.2484\,\pi \\ +3.4847 &= +14.9756 \quad +17.4854 \quad -\ 8.1319 \\ +0.6419 &= -\ 0.2484 \quad -\ 8.1319 \quad +23.7027. \end{aligned}$$

The results of the solution of the above equations are—

Star (*a*) ... $\pi = +0''.0709 \pm 0''.0305$ ... weight 3.710
Star (*b*) ... $\pi = +0.0374 \pm 0.0255$ ... weight 4.158.

On comparing these results with those already given (page 135) deduced from twenty-five nights, and which are here repeated for convenience—

$$\text{Star } (a) \ldots \pi = +0''.0729 \pm 0''.0309 \ldots \text{weight } 3.664$$
$$\text{Star } (b) \ldots \pi = +0.0371 \pm 0.0256 \ldots \text{weight } 4.027$$

it appears that no material alteration has arisen by increasing the number of nights from twenty-five to thirty, either as respects the parallaxes or the 'weights' attached to them.

On pursuing a similar line of investigation as to the effects of *reducing* the number of the sets of observation, by the omission of the two sets made in the months of November and June, when, for these stars (a) and (b), the co-efficient of parallax was less influential, the following results were deduced :—

$$\text{Star } (a) \ldots \pi = +0''.0522 \pm 0''.0463 \ldots \text{weight } 2.277$$
$$\text{Star } (b) \ldots \pi = +0.0375 \pm 0.0466 \ldots \text{weight } 2.444$$

wherein are exhibited considerable alterations both in parallax and 'weight.'

From all the above details, which may be regarded as important and decisive as to the number and distribution of the sets of measures which it is desirable to make, the inevitable conclusion appears to be that the plan of curtailment herein already adopted in these researches is at once economical and satisfactory, and I am thereby encouraged to continue the method with reference to the remaining stars of the second magnitude.

I conclude with a summary of the Results, obtained in the foregoing investigations.

Summary of Results.

Star's Name.	Magnitude and (Proper Motion) of Star.	Designation of Comparison Star.	Relative Annual Parallax.		Photometric Magnitude of Comparison Star.	Approximate Distance of Comparison Star.
			″	″		″
61_1 Cygni	4.98	*a*	+0.429	±0.016	7.73	1380
	(5″.16)	*b*	.441	± .022	8.67	1003
		c	.445	± .021	8.88	1118
		d	.419	± .018	9.34	953
61_2 Cygni	4.98	*a*	+0.425	±0.018	7.73	1360
	(5″.16)	*b*	.451	± .019	8.67	1024
		c	.432	± .019	8.88	1107
		d	.430	± .018	9.34	961
μ Cassiopeiæ ...	5.40	*a*	+0.051	±0.027	7.89	756
	(3″.75)	*b*	.021	± .023	8.38	1356
Polaris	2.05	*a*	+0.084	±0.023	8.22	1285
	(0″.05)	*b*	.078	± .017	8.30	1056
		c	.052	± .011	6.84	1182
		d	.100	± .018	9.75	1634
α Cassiopeiæ ...	2.41	*a*	+0.034	±0.024	8.68	1042
	(0″.05)	*b*	.040	± .020	9.26	849
		c	.034	± .025	10.19	667
		d	.035	± .024	9.30	1113
β Cassiopeiæ...	2.32	*a*	+0.200	±0.034	9.20	440
	(0″.55)	*b*	.128	± .037	9.14	1305
		c	.131	± .034	8.33	664
		d	.157	± .036	9.24	1475
γ Cassiopeiæ ...	2.19	*a*	−0.018	±0.037	10.64	1356
	(0″.02)	*b*	+ .059	± .044	9.39	741
		c	+ .041	± .029	10.27	465
		d	− .032	± .026	8.93	1221
α Cephei.........	2.57	*a*	+0.073	±0.031	9.08	989
	(0″.16)	*b*	.037	± .026	9.25	673
		c	.017	± .025	8.98	511
		d	.119	± .027	9.11	878

From a survey of the foregoing results an enquiry naturally arises as to the relations between the apparent relative lustre of the stars, their parallaxes, and their proper motions. It is true that the element here last mentioned is imperfectly determined, so long as the motions in the line of sight remain

unknown; but in the long run it seems probable that the latter do not seriously modify the amount of the final resultant motions themselves.

Even on a cursory examination of the foregoing summary, it is evident that no relation exhibits itself between the lustre and the parallax: nor in fact should we expect to find any such relation, if, as we have some reason to suppose, the stars in our system are still in various stages of condensation, and of chemical or even mechanical interactions of their component materials. The case, however, is very different in respect to a relation between parallax, or distance, and the apparent proper motion of a star, as seen by us. Here we should naturally expect to find that the observed motions of stars would be materially influenced by their distance from the point of observation, our earth or the sun, provided there is some systematic connection, as we presume there is, between these proper motions themselves.

Dr. Oudemans in a very valuable and interesting memoir just printed in the *Ast. Nach.*, No. 2915, has collected all the reliable parallactic determinations yet made (not yet amounting to fifty), and has tabulated them in five groups of nine stars each, arranged in the order of their proper motions, and the prominent conclusion to be drawn therefrom is, that so soon as the observed proper motion of a star falls below one-twentieth of a second of arc, its parallax may be expected to fall below one-tenth of a second. This concluded relation between proper motion and parallax may indeed be somewhat modified by the fact, that the selection of stars for the determination of parallax has hitherto been greatly influenced by the consideration of their known large proper motions; nevertheless, this last observation hardly applies to those series of stars, selected for parallactic investigations on grounds quite irrespective of motion, such as the groups of the first and second magnitude stars submitted to observation by Dr. Elkin and myself. It must not, however, be overlooked, that any final conclusion on this subject is necessarily premature on account of the small number of parallactic determinations available for discussion.